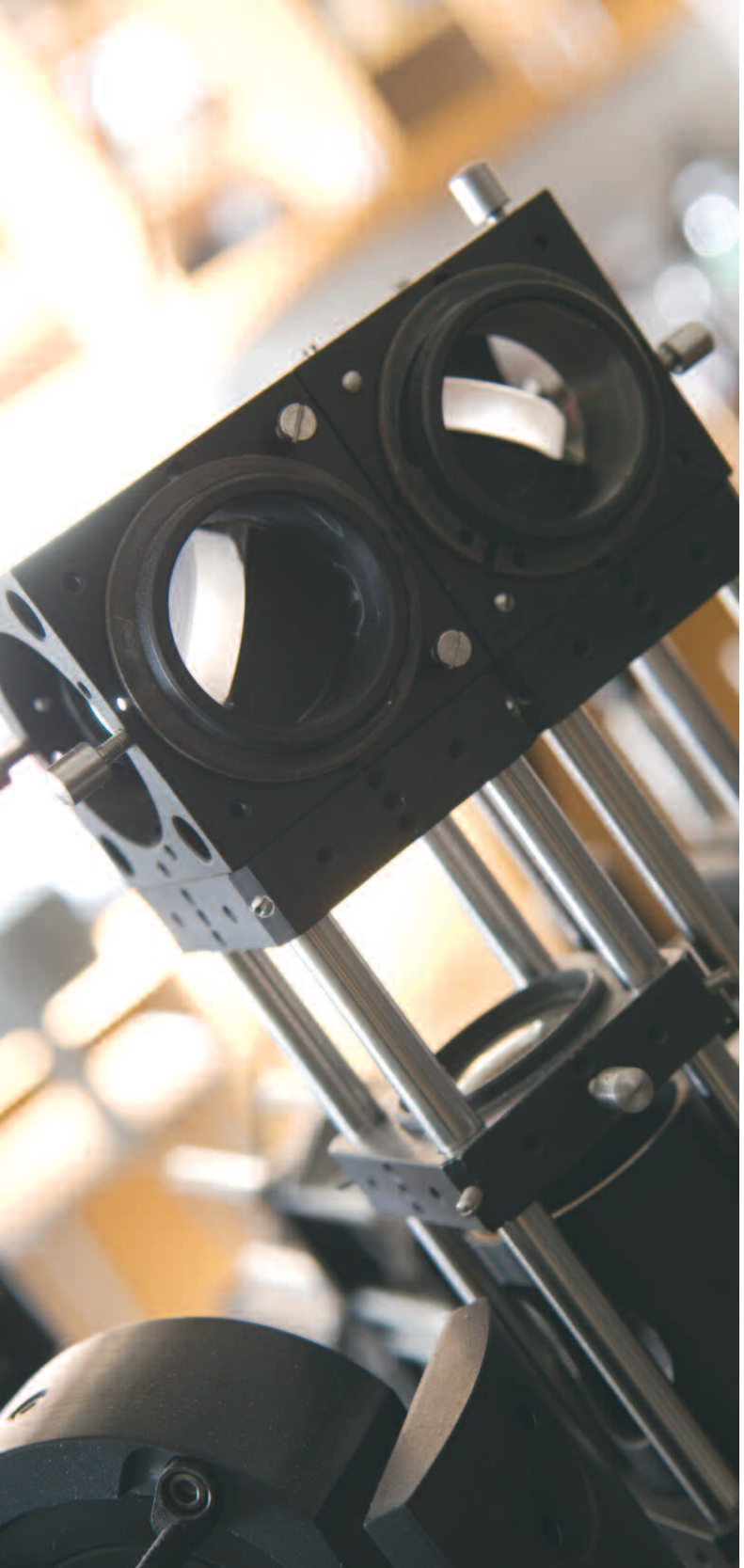
BU College of Engineering
MAGAZINE
SPRING 2008

Study Abroad

and the Globalization of Engineering



BU College of Engineering MAGAZINE

SPRING 2008

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The *BU College of Engineering Magazine* is produced for the alumni and friends of the Boston University College of Engineering. Please direct any questions or comments to Michael Seele, Boston University College of Engineering, 44 Cummington Street, Boston, MA 02215. Phone: 617-353-2800; fax: 617-353-5929; e-mail: engalum@bu.edu; website: www.bu.edu/eng.

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Inside

COVER: Aaron Seaman (BME'09), fellow international Tel Aviv University student Sarah Dolgoy and David Scaduto (BME'09) traveled to the ancient city of Petra, Jordan, during their semester abroad in Tel Aviv, Israel. [Photo courtesy of Aaron Seaman]

COVER STORY

FEATURES

DEPARTMENTS

Engineering Education for the 21st Century

By Dean Kenneth R. Lutchen

There is no more important mission for an engineering school than preparing its undergraduates for their careers. In today's rapidly evolving engineering landscape, we have an increased obligation to transform the undergraduate educational experience from the traditional pedantic curriculum in explicit disciplines to a broader foundational experience for lifelong success.

Engineering, by its very nature, requires its practitioners to continue to learn long after their formal education ends. This has never been more true than today, when we can see an accelerated pace of engineering innovation continuing for decades. Engineers need to evolve, and so do engineering schools.

At the College of Engineering, we're taking on that challenge by broadening the education of our students. While mastery of the technical aspects of engineering must remain at the curriculum's core, we need to add new dimensions that will better prepare students for the world of today and tomorrow.

We want to provide an undergraduate education that ensures our graduates can be the creators—the artists, if you will—of the scientific and quantitative spheres. They need to understand how technology works so they can be effective as innovators. They also need "soft" skills, such as the ability to communicate their technical ideas and concepts and galvanize a wide array of people, including those without technological backgrounds and people from other cultures. Combine these skills with the ability to be lifelong learners, and our graduates have the potential to make real impacts that can better our quality of life for generations to come.

The first thing we need to do is capture the imagination of freshmen as soon as they arrive on campus. The traditional first-year courses focusing on math, science, physics and computing are designed to build the fundamental technical skills and are necessary. They are also difficult, and unless students see how this material relates to the extraordinary innovation potential of their chosen major, we run the risk of turning them off to engineering right away. Also, a first-year course explicitly dedicated to introducing students to areas in which engineering advances society could help freshmen see the forest while they climb the trees.

We offer enrichment experiences that must expand so more students can take advantage of them. For example, the study abroad program we began in 2001 in Dresden, Germany, was immediately popular. Students crave the international experience, and a program that enables engineering sophomores to fulfill their course requirements overseas—and thus not delay their graduation—has great

appeal. We've added similar programs in Mexico and Israel, but there remains more we can do.

We also are rapidly expanding the opportunities our students have to work in faculty research labs—this has emerged as another popular endeavor for them and one where they are enjoying great success. We offer a great number of internship and co-op placements for our undergraduates that are heavily utilized.

Recently, the College expanded community service opportunities by establishing a chapter of Engineers Without Borders; our EWB students are now scouting a project that aims to bring electricity to a remote Peruvian village. More of these opportunities are needed at the global, national and local community levels.

We can also do more to broaden our students' horizons right here on campus. We have begun to explore joint courses with other schools and colleges at BU that have special applications for engineers, among them a potential business-to-innovation program with the School of Management. There is also a new program in materials science and engineering that engages faculty and courses from engineering and other departments—like physics and chemistry—and which will support a minor available to all of our engineering students.

Engineering leaders this century need a broad education that goes beyond the classroom and the laboratory. The engineering profession is poised to make its most significant impact on human history in the coming century and Boston University graduates should be on the crest of that wave.

New Graduate Degrees Planned for 2008

By Jason L. London

Capitalizing on established and emerging interdisciplinary strengths, the College of Engineering will offer new graduate degree programs in Materials Science and Engineering, Biomedical Engineering, and Systems Engineering in the fall.

The College plans to expand its master's and doctoral programs in biomedical engineering to include a Master of Engineering degree. Unlike the existing programs, the new degree will not require a thesis and is aimed at biomedical engineers working in industry. A similar degree in Systems Engineering, as well as a new Master of Science degree, will complement the doctoral program in that area.

New programs in Materials Science and Engineering will include Master of Science and doctoral degrees, the latter having both post-bachelor's and post-master's tracks. Courses in the Materials Science and Engineering degree programs are likely to be drawn from the College of Engineering as well as other departments throughout Boston University, such as physics and chemistry.

"The new degree programs in Materials Science and Engineering will be truly interdisciplinary," said Professor Soumendra Basu. "They will bring materials and researchers from various departments and colleges into the same classrooms and help build a community that fosters new collaborative research ideas."

While Boston University has not previously offered a formal degree in Materials Science and Engineering, there has long been materials science expertise among the faculty. Materials science applications to solid-state materials, energy materials, biomaterials and materials processing have long been productive faculty research avenues.

"Boston University is already home to outstanding materials scientists," Professor Theodore Moustakas said. "The new program will provide faculty and students with a new base from which to practice their interdisciplinary research."

The Master of Engineering in Biomedical Engineering has been developed specifically for students seeking careers in the biomedical industry and will focus on the transfer of innovation from research lab to practical use. The 32-credit degree will allow students with careers in the biomedical industry—as well as those interested in entering the field—the opportunity to learn more about this area while focusing on topics relevant to industry, such as intellectual property and commercialization. The program is designed for students interested in engineering design, development, manufacturing and management.

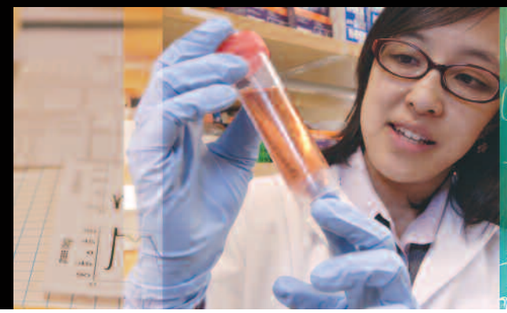
"The Master of Engineering in BME is an innovative program that blends graduate-level engineering coursework with topics related to technology evaluation, translation and intellectual property," said Professor Solomon Eisenberg, the BME chairman ad interim. "We feel this program will be more attractive to practicing professionals than the more research-oriented M.S. program."

Training students in complex systems analysis and control and decision sciences, the new Master of Science and Master of Engineering degrees in Systems Engineering will augment the doctoral program and further capitalize on the research activities of faculty affiliated with the Center for Information and Systems Engineering (CISE).

The new Systems Engineering programs will offer a balance between theory and application and will appeal to both industry professionals and students continuing from a bachelor's with quantitative backgrounds. The more research-based M.S. will require a thesis, while the M.Eng. will focus more on practicum with advanced project work in lieu of a thesis. With a variety of minor concentration areas, graduates of these new programs will be able to pursue either doctoral research or employment opportunities in communications and networks, computational and systems biology, control systems and robotics, financial engineering, manufacturing systems and supply chains, and operations research.

"Systems engineering is a reflection of a world increasingly consisting of many hardware and software components with complex interactions that define a system," said Professor Christos Cassandras. "This requires a science for designing, managing and maintaining such a system in diverse application environments. Indeed, engineering as a whole is rapidly becoming more interdisciplinary."

For more information on Materials Science and Engineering, send an e-mail to materialsscience@bu.edu. For details about the new master's degree in Biomedical Engineering, contact Rene Smith at smithr@bu.edu or 617-353-7609. For information on Systems Engineering programs, contact Elizabeth Flagg at eflagg@bu.edu or 617-353-7609.



Engineering Students Gain a Global Perspective

Instituto Tecnológico de Monterrey, Guadalajara, Mexico [Photo courtesy of BU International Programs]

A troop of engineering students from BU and other universities visited the statue of Karl Marx and Friedrich Engels in Berlin. [Photo courtesy of Chris Vandevoordt]

A statue of Lord Murugan stands at the entrance to Batu Cates near Kuala Lumpur, Malaysia. [Photo courtesy of Else Frohlich]

A World of Learning

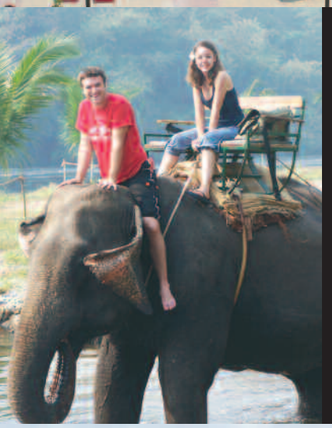


Photo left: Aaron Seaman and Else Frohlich visit Thailand. [Photo courtesy of Aaron Seaman]

David Scaduto visits Wadi Rum during his semester abroad at Tel Aviv University. [Photo courtesy of David Scaduto]

Dresden, Germany [Photo courtesy of BU International Programs]

David Scaduto, Aaron Seaman, Anna Yanko and Erin Allen, the first BU engineering undergraduates to study abroad at Tel Aviv University in Israel.

By Kate Fink

"The spirit we had going in to it was to let go of things here and not expect it to be America in another place. I think that's important for anyone studying abroad—the way to experience it is to let yourself be a part of it," said Aaron Seaman (BME'09), who was among the first group of BU engineering students to study in Tel Aviv, Israel, in the spring of 2007. "There are differences everyplace."

Take the dormitories, for example.

"They were modest, which was fine," said Seaman's roommate in Tel Aviv, David Scaduto (BME'09). "And difficult to keep clean, but that's just because they do it differently. The floors are all tile, and there's a drain in the middle. You move all the furniture out, splash a bucket of soapy water all over the floor, and use a big squeegee called a 'magav' on it. That's cleaning the way they do it."

The two roommates soaked up the new culture and customs and thought the squeegee method was a clever way to clean, but with differential equations and circuit theory to learn, intensive Hebrew class, travel and trips to the nearby beach, somehow they just never found the time to give their accommodations such a thorough treatment.

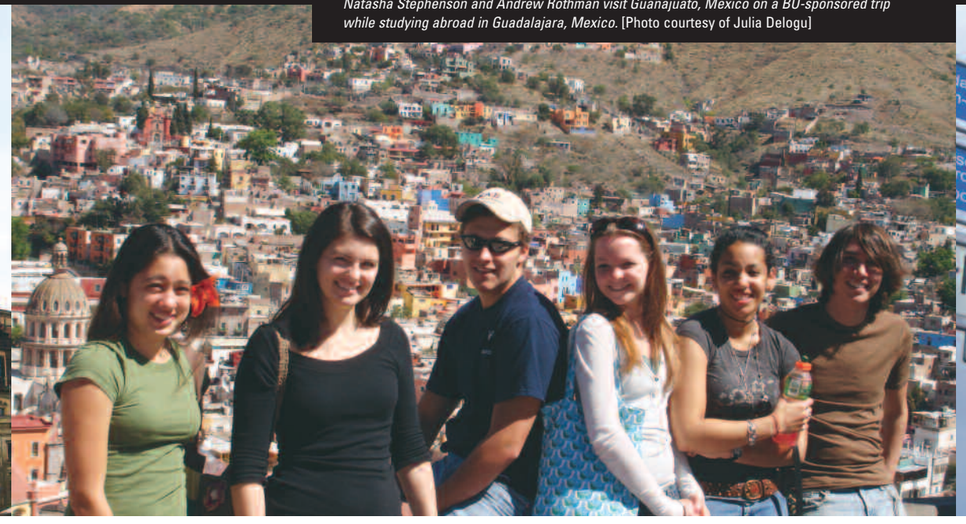
"Which led to sand buildup in multiple locations in the room," said Seaman. "Sand sticks to everything and will always return with you."

The day-to-day differences in a foreign country may seem inconsequential, but, like the sand, these experiences accumulate over months spent abroad. Students' lives change and their views of the world and plans for the future shift.

As the workplace globalizes and engineers from far corners of the world work more closely together, the perspective gained by studying abroad is rapidly becoming extremely valuable to engineering students.

"Living abroad definitely added an international emphasis to my life," said Scaduto. "It's deepened my passion to reach out beyond our borders to this whole global community. I think

Dresden, Germany [Photo courtesy of BU International Programs]



From left, Lauren Tuthill, Julie Sygiel of Brown University, Adam Detwiler, Carden Ryder, Natasha Stephenson and Andrew Rothman visit Guanajuato, Mexico on a BU-sponsored trip while studying abroad in Guadalajara, Mexico. [Photo courtesy of Julia Delogu]

Julia Delogu (AME'09) visits the ancient city of Teotihuacán near Mexico City during her semester abroad in Guadalajara, Mexico. [Photo courtesy of Julia Delogu]

Aaron Seaman (left) and David Scaduto plant trees during the Tu B'Shvat holiday while studying abroad in Tel Aviv, Israel.

"The point of the programs is that students don't have to sacrifice or make a choice between losing time towards a degree or somehow not being able to fulfill their technical requirements."

it also makes you realize that you are part of this human society. Yeah, you are American or Israeli, but you're all humans."

This life-changing opportunity was virtually off-limits to engineering students until recently.

BU pioneered unique study abroad programs for sophomore engineering students in 2001 by offering a semester in Dresden, Germany, expanding its offerings in 2006 to include Guadalajara, Mexico, and adding a program in Tel Aviv, Israel, in 2007.

Study abroad, long the provenance of social science, language and liberal arts students, used to be so obstacle-strewn for engineering students that very few even tried to go abroad during college. The need for specific technical classes, coupled with language barriers, made study abroad nearly impossible for engineering students who wanted to stay on track to graduate in four years.

Although engineering students comprise just three percent of the nearly quarter-million American students who study abroad each year, their ranks are growing. In 2005–06, engineering undergraduates traveling abroad numbered 6,556, a 58 percent increase in just six years.

At BU, 52 undergraduate engineering students studied abroad last year. In all, by the end of the 2008 spring semester, 233 students will have participated in BU sophomore engineering study abroad programs, including 23 students from other universities such as Brown, Tulane and Vanderbilt.

"The point of the programs is that students don't have to sacrifice or make a choice between losing time towards a degree or somehow not being able to fulfill their technical requirements. We're trying to remove those barriers so that engineering students will be able to get all the benefits of going abroad," said Associate Dean for Undergraduate Programs Solomon Eisenberg. "It's well-roundedness, it's an understanding of being 'the other,' the notion of not speaking the language and having to deal with that for a while—all of those experiences that are really transformative."

The rigid structure of engineering curricula dictates a specific order of class work that builds upon each past semester. Though most engineers around the world graduate with similar knowledge, each institution packages the information differently along the way, making it tricky to find courses that fit the specific BU curriculum.

BU's study abroad programs solved these problems, freeing engineering students to study, live and learn in other parts of the world. In tailor-made classes, the host universities teach the specific set of courses BU sophomores need.

The first engineering study abroad program at the Technical University of Dresden was possible largely because of Boston University's established presence there. It was already one of many study abroad locations around the world that the University had developed over the years, and its faculty agreed to add engineering courses—taught in English—for BU sophomores.

"Boston University can leverage its position as a major research institution with a wide network of international partnerships and existing centers abroad to successfully develop programs of this kind," said Ben DeWinter, Associate Provost of International Education.

"Dresden is an interesting place because there's a lot of economic development and industry, and there's a long history of technological development in the area," said Eisenberg.

The first 12 engineering students traveled to Dresden in the spring of 2001. A total of 193 students have now attended the Technical University of Dresden; 30 students traveled to Guadalajara in that program's first three years; and four students pioneered the Tel Aviv University offering in 2007, with another six attending this spring.

The Instituto Tecnológico de Monterrey in Guadalajara diversified the College's offerings with an experience different from that of Europe, as well as close proximity to the U.S. and a Mexican culture adjusting to a new, technological economy.

"Mexico has been restructuring its position from being a low-cost producer to a higher-value, more strategic potential partner with companies in the United States, and Guadalajara is the center of a lot of that activity. It's an interesting time for the Instituto Tecnológico de Monterrey, which is playing a leadership role in rethinking how to position the Mexican technical economy in this evolving global space," said Eisenberg.

At each of these locations, students take three engineering classes in order to continue seamlessly on to BU's junior year curriculum, as well as a social science course in which they learn about the culture and technology of the area. Although the courses are taught in English, an intensive language course is also included to facilitate the students' integration into the local society during their semester-long stay.

Julia Delogu (AME'09) studied in Guadalajara during the spring 2007 semester. Though many students on the university campus came from wealthy families and went home to farms and lake houses during school vacations, she also saw extreme poverty off campus when she took a bus trip down the coast during a school vacation with BU friends.

"One of the site coordinators volunteered at a foster home for young boys in downtown Guadalajara," said Delogu. "So I did that with her. It was nice to help out the community and immerse myself in the society."

In Dresden, Chris Vandevoordt (AME'08) and classmates went on engineering-related trips to a uranium mine and the local Volkswagen factory, where they took a behind-the-scenes tour most visitors don't see.

"One of my professors also showed me some of the experiments he was doing over in Germany; it was really cool to see and to get to know the professors over there," said Vandevoordt. He also met many German students by playing in an intramural basketball league.

Scaduto and Seaman participated in Tu B'Shvat—a holiday with Jewish origins observed across Israel as a countrywide celebration of life—by planting trees outside the city of Tel Aviv.

With many of the obstacles to travel now removed, the College continues to expand its global offerings. Several juniors, including Seaman, are studying in Singapore for the 2008 spring semester, pioneering a new program at the National University of Singapore. Future offerings for juniors will include programs in English-speaking countries such as Ireland, Australia or New Zealand, where students can directly enroll in classes already held at universities in these countries.

Singapore and future programs for juniors will involve much more independent planning and preparation. Unlike the sophomore programs, coursework is not specifically built to fit the BU curriculum. Instead, juniors enrolling at these institutions need to carefully assess course offerings at international universities and decide whether the content fits their needs and can be transferred back to BU.

Though the travel destination of engineering students is not specifically dictated by their majors—as it might be for an art student going to Venice—no matter where they go, the experience is enormously valuable.

After living abroad—where students speak the native language, meet the people, eat the food, travel independently and learn how local companies and universities work—they see their own world with fresh eyes. These shifts in perspective give them new ideas of where they want to go in the future and the kind of differences they can make as engineers.

"It broadened my perspective," said Kelli Bechly (BME'08), who studied in Dresden in the spring of 2005. "Someday, I really do want to live in another country and now I realize that's not unreachable."

Aaron Seaman (far left) walks into the ancient city of Petra. [Photo courtesy of David Scaduto]

Alumni of the Dresden study-abroad program, from left, Benoit Schmitlin, Edwin Cheung and Jessica Peters

Students studying in Dresden visit the Königstein uranium mine, in use until 1991. From left, Eddie Walton, Kevin Burek, Christine Reinders, Raymond Taylor, Timothy Cieslak and Kyle Kasparek. [Photo courtesy of Chris Vandevoordt]

In a survey of past participants of the Dresden program conducted in 2006 by the College of Engineering, 49 of 61 respondents said they thought their experience would influence what they will be doing in 10 years. A third of the students also said they were interested in working abroad in the future.

Upon his return, Seaman took a look at how he could best achieve his long-term goals of working abroad and using his engineering education to solve international problems.

"I want to do things now in my education so that I can facilitate that dream of helping people, but in a way they want, rather than just going in there and saying, 'I'm the American, I have everything and you don't have anything,' because that's not true. I've learned in my travels that a lot of people who have less money and things than we do actually have a lot more," he said.

The global awareness and independence fostered by studying abroad also make students more appealing to employers.

"It's increasingly likely that in their careers, students are going to be working on global teams with colleagues around the world. The nature of how we work is changing very rapidly in technical fields," said Eisenberg.

"It completely changed the way I was planning my life after graduation," said Ray Taylor (MFG'08), a Dresden program alum. "I want the beginning of my engineering career to be as diverse as possible. I'm looking for rotational programs where you get to go to different locations instead of staying in one place. I appreciate change; I want to be in different situations and have to face challenges that I wouldn't otherwise have."

Mike McCullough (ENG'03), who works at GE Aviation in Lynn, Massachusetts, participated in the first engineering study abroad semester in Dresden and experienced a similar feeling when he returned to the U.S.

"Complete immersion in a different culture was the biggest benefit of my study abroad experience," McCullough says. "My conventional thinking was challenged as I was constantly forced to consider alternate approaches to common and routine tasks—like grocery shopping—and technical and specialized concepts like German engineering."

After college, he entered a GE rotational program, working at four locations over two years, then traveled "100 percent of the time" for two more years to GE offices throughout the U.S., Europe, and Central and South America. "Thanks to my study abroad experience, I was well prepared to work through many cultural barriers and now have a global perspective."

As part of a team that recruits new graduates, McCullough now looks for these qualities in people he hires. Seeing study abroad experience on a résumé means "that person can easily adapt to new situations and the associated challenges."

Engineering students face new challenges every day when living and studying abroad. Each piece of this experience—trying to order food in a foreign language; navigating new cities; finding that shops close at 2 p.m. on Fridays in preparation for the Sabbath in Tel Aviv; realizing that in a German engineering class instructions to 'sketch' a sine curve mean precisely graphing the line or precious points will be lost; or having friendly arguments about whether to converse in Spanish or English because students of each nationality want to improve their skills in the other's language—adds to their understanding. By the end of a semester far removed from the familiarity of Boston, students have learned about themselves, engineering as a global discipline and the ever-shrinking world around them.

Vandevoordt said, "It might sound kind of cheesy, but our motto is 'We Change the Way the World Works,' and you actually have to know the way the world works before you can change it."

By Kate Fink

Overcoming Obstacles through Networking

Alum Michelle Tortolani, 2008 president of the Society of Women Engineers, finds ways to be heard

As the president of the Society of Women Engineers, Michelle Tortolani delivers a speech at the organization's 2007 annual meeting.

Michelle Tortolani (BS'82, MS'89) specializes in networking—at grocery stores, on top of tall buildings, and with a nationwide community of women engineers. In her day job, she weaves together networks of radio waves for XM Satellite Radio Inc., and as the president of the Society of Women Engineers (SWE), she connects students, engineers, corporations and policy makers.

The SWE announced Tortolani's appointment as the organization's 45th president in August of 2007. She has been a member since her freshman year at the College of Engineering and will hold the position for the 2008 fiscal year. SWE, founded in 1950, is a not-for-profit educational and service organization that offers aspiring engineers and working women engineers career guidance, professional development and a supportive community of 20,000 peers.

Tortolani's career path began with a conversation at a grocery store, where she had a summer job during high school and where she met a co-worker who was studying electrical engineering in college.

"I told him I liked math and science and he said, 'Well, did you think about engineering?' I hadn't heard about it at high school," said Tortolani.

With engineering in mind, Tortolani headed to Boston University from her home in Rhode Island, entered the College of Engineering, joined SWE during the second semester of her freshman year, and became the group's treasurer. After college, her life and career took her around the country, but Tortolani maintained her connection to SWE in the Los Angeles, Orange County, Boston, Houston and—now—Baltimore-Washington sections. Tortolani has held a variety of positions for the Society at the sectional, regional and national levels and has helped lead initiatives that strengthen the society's membership, professional development and public policy programs.

"SWE gives you different things at different times throughout your life," said Tortolani. "As a college student, I joined SWE to learn more about the career opportunities in my chosen discipline, electrical engineering, as a resource for finding summer and permanent employment, and to meet other women engineers."

During her junior year at BU, Tortolani attended the 1981 SWE National Conference and met a representative of Hughes Aircraft Company at the event's career fair. After graduation, this connection led her to Los Angeles for her first engineering job. Three years later, she returned to BU to complete a master's degree in electrical engineering because she liked the small size and personalized attention of the graduate program.

Having worked at large companies before and during her master's degree studies, Tortolani decided to make a change.

"It was my goal to make the transition from engineer to manager, and you can do it

"SWE membership means different things to different members, but we are all driven by the underlying goal to be a positive force for women in the world of engineering and technology."

more quickly if you jump into a small company. So when I moved to Washington, D.C., I started with a small systems engineering company," said Tortolani.

Eight years ago, she joined XM Satellite Radio Inc., a company headquartered in Washington, D.C. The XM system broadcasts a digital radio signal via geostationary orbit satellites and terrestrial repeaters to mobile receivers in personal automobiles, commercial trucks, recreation vehicles, and to portable and home-based receivers in the continental United States.

"What attracted me was the exciting new technology. I like to get in on the front end of development and be a part of defining the requirements for a system," she said. Now a senior director of repeater engineering and operations, Tortolani keeps many urban motorists happy by making sure the music programs and talk shows they want to hear reach their radios in an uninterrupted stream.

Tall buildings can block radio signals in cities, obstructing XM satellite reception. To overcome this problem, a network of terrestrial repeaters broadcasts the same programs as the satellites. The repeaters, each about the size of a refrigerator, perch on rooftops and tower structures, where they receive and decode the satellite signal, modulate a different waveform, and amplify and broadcast the terrestrial XM signal, assuring that customers can tune in without interruption in urban areas.

Tortolani manages the development and implementation of these repeater networks. At first, she traveled to cities across the country as the repeater hardware went into action; she now works on designing and developing improvements to it and managing the many vendors that maintain and repair the network equipment.

"What I find most exciting in my job is the opportunity to manage a program from the system perspective and to be responsible not only for the technical aspect but also the financial, management, performance and implementation beginning to end," said Tortolani.

She also gets to take advantage of her own handiwork. "Right now I'm listening to Top Tracks, station number 46," (a classic rock hits channel and one of XM's more than 170 stations). "Whenever I get in someone else's car, they want to let me pick the station, but I say, 'No, listen to what you like to listen to.' It's interesting. You get introduced to different channels you might not check out on your own."

Tortolani approaches her SWE presidency in a similar way—by emphasizing solid networking and keeping an ear tuned to members' feedback.

"There are two initiatives that I am particularly passionate about personally and in which SWE, as an organization, has made significant progress—professional development and public policy," she said. According to Tortolani, these areas, previously weaknesses of SWE, are now strengths of the Society.

Four years ago SWE did not have a strong national professional development program; today, members give rave reviews to SWE's offerings that allow working members to view webcasts live or replay them at a more convenient time later. Members asked for programming addressing different career stages and paths and the issues members encounter in the work force. SWE has stepped in to fill this need with professional development tracks, from young professionals to managers and executives, consisting of face-to-face seminars, webinars, podcasts and discussion groups. SWE also offers professional development programs for collegiate members.

In public policy, Tortolani aims to make SWE the government's primary resource on women in Science, Technology, Engineering and Mathematics (STEM) fields. SWE has written position papers, briefed Congress and chairs the planning committee for the newly formed Congressional Diversity and Innovation Caucus. In this role, SWE will plan briefings and educational programs for members of Congress and their staffs on the importance of diversity in STEM fields.

"There is a lot of opportunity in engineering. SWE membership means different things to different members, but we are all driven by the underlying goal to be a positive force for women in the world of engineering and technology," said Tortolani. "Networking is still at the core of SWE."

By Jason L. London

Research Is 'Heart' Work

Pierre Dupont tackles the limitations of cardiac surgery

The earliest recorded successful cardiac surgery dates to 1896, when German physician Ludwig Rehn repaired a stab wound to a patient's right ventricle. In the 100-plus years since, cardiac surgery has evolved to include the complex repair of injuries, birth defects and diseased tissue. Despite tremendous advances in medical technology, limitations in cardiac surgery remain.

Professor Pierre Dupont (AME) is working to overcome these barriers by developing surgical instruments and imaging technology so open-heart surgery can more often become a minimally invasive procedure.

"On a variety of fronts, we're trying to produce a new model for how heart surgery is done," Dupont said. "I'd like to see the point where we're not cutting the heart open as often as we do now. That's going to require the development and integration of new instrumentation and imaging technology and a fresh perspective on surgical techniques."

Dupont's most recent research stems from a five-year, $5 million National Institutes of Health grant he received in collaboration with Children's Hospital of Boston to develop minimally invasive surgical instruments to fight disease and repair defects inside the human heart. The goal of the grant, which began in the summer of 2007, is to develop instruments that will eliminate many of the limitations of minimally invasive cardiac surgery. The instruments would enter the chest and heart wall through needle-sized incisions and snake their way—under surgeon control—to the surgical site.

"There are two approaches to repairing problems inside the heart: open-heart surgery and catheter-based interventions," Dupont said. "With catheters, you don't have to cut the chest and heart open, but in comparison to open heart surgery, what you can accomplish is limited. We're trying to incorporate the best of both approaches. We want to produce instruments as minimally invasive as catheters, while providing the precision and control of open-heart surgery."

Pierre Dupont's (AME) research in instrumentation and imaging will make cardiac surgery more precise and less invasive.

Exceeding current levels of precision and control requires more than improved instrumentation, Dupont said. Enhanced imaging techniques are also needed to enable the surgeon to navigate instruments through the beating heart.

"Instrumentation and imaging is a hand-in-hand effort," he said.

On this front, Dupont is in the final year of another five-year grant to study real-time, improved three-dimensional imaging for cardiac surgery. This research has focused on adapting ultrasound techniques so that instruments and cardiac tissue, which have very different acoustic properties, can be imaged simultaneously during surgery.

"We've made a lot of progress," Dupont said. "Our clinical partners are now convinced they can reliably perform simple surgeries inside the beating heart under ultrasound guidance. For more complex repairs, though, there's more work to be done."

Although developments in instrumentation and imaging are in the early stages, Dupont hopes these advances will have a lasting influence on cardiac surgery.

"Academia is a profession where it is very easy to become so specialized that only a few people in the world care about your research," Dupont said. "But if your research is finding better ways to fix their hearts, everyone is interested. I don't want to disappoint them."

By Jason L. London

By Kate Fink

Young Innovators Add Spark to ENG Labs

Student team builds a satellite

For many college students, summer work is hardly extraordinary. They may wait tables or perhaps work as camp counselors in an effort to earn extra money and pass the time between academic years. When school resumes, summer jobs are left behind and largely forgotten.

Not so for 30 College of Engineering undergraduates who spent last summer building a working satellite for the U.S. Air Force's University Nanosatellite Competition Program. Under the guidance of Professor Ted Fritz (CAS) and doctoral student David Voss (ENG'09), the BU team was among 11 others also representing universities given the chance to design and build a working satellite, with the winning invention guaranteed a launch into space.

Much more than a summer project, the competition began in February 2007 and will

Aaron DesRosiers showcases the work he and teammates have been doing on a nanosatellite project for the U.S. Air Force.

Rahul Ahuja holds a Petri dish smeared with Shewanella oneidensis, *the tiny bacteria that take center stage in his research.*

Undergrads take on real-world challenges in advanced research

***Shewanella oneidensis* lives** contently with or without oxygen. It will eat metal for breakfast if that's all that's around. About a hundred of these tiny bacteria could fit end-to-end in the dot of this i. Their DNA and energy-producing machinery float within the soup of their tiny cytoplasmic innards, all bound together by two plasma membranes and a thin cell wall.

Despite its diminutive size, *S. oneidensis*—along with many helpful human labmates and advisors—has become an inspirational teacher for three engineering undergraduates. Rahul Ahuja, David Shi and Christian Ling (all BME'09) have made the bacteria, fondly known to the group as "Shewy," their near-constant companion in the lab and have learned numerous lessons from it as they research and tinker with the bacteria's inner workings.

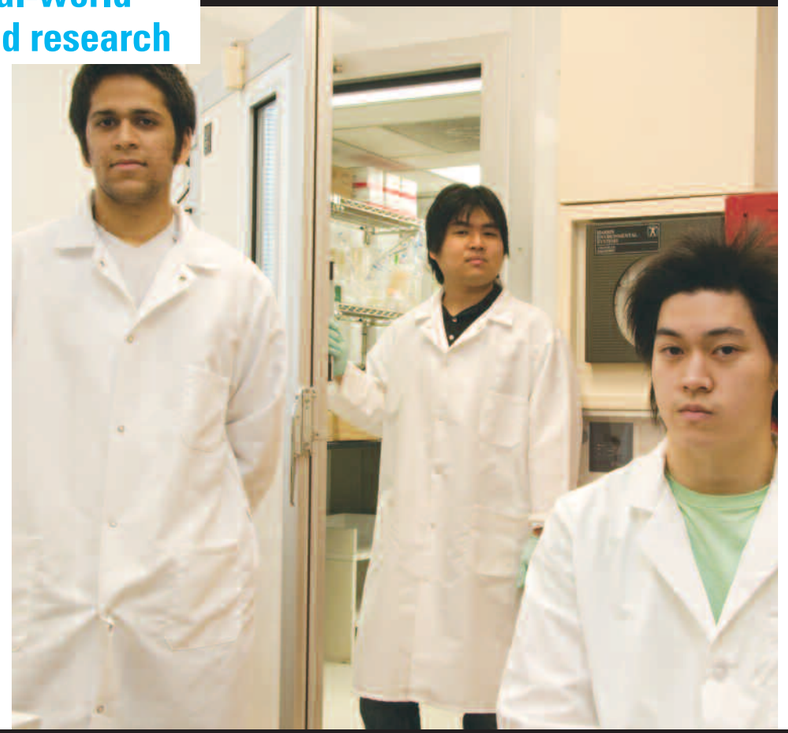
The three students teamed up last summer to work full time in the laboratory on

Undergrads take on real-world challenges in advanced research

a project for the International Genetically Engineered Machines (iGEM) competition. More than 50 student teams from around the world enter the friendly contest that culminates in a November Jamboree at MIT. Each team works throughout the summer to create a bacteria-based project within the field of synthetic biology that applies engineering principles to living things. Researchers in the field create and manipulate interchangeable pieces of DNA to program bacteria to perform specific tasks.

The BU team works on *S. oneidensis* because of this bacteria's unique ability to produce electrical energy. The bacteria churn out a current that might eventually feed into fuel cells, providing a source of clean, green energy. It may also prove handy for decontaminating soil or water because, in producing its electric current, it can feed on harmful metals. But, Shewy "in the wild" generates only a weak current.

Photo right: Rahul Ahuja (BME'09), Christian Ling (BME'09) and David Shi (BME'09) bring their game faces to lab as they mold the genetic make-up of Shewanella oneidensis *to fit the jobs they have planned for the bacteria.*



Ahuja, Shi and Ling work on mutating the bacteria's genes to create a strain that efficiently produces much more electricity—up to 1,000 times more—a needed improvement before the bugs can be put to work in fuel cells.

The project opened the door for these three students to experience working as research scientists, complete with frustrations and "eureka" moments. Throughout the College of Engineering's labs, they are among many undergrads who are stepping up to lab benches, computers and complex machinery to take on meaningful and productive roles in research. Undergraduates who seek out research experiences at ENG find a wealth of opportunities and add a new facet to their education.

"As soon as we step into the lab, we know we're there on our own time—we're choosing to be there, it's not for a grade or anything," said Ling. "We're there for our own benefit. When you have that understanding, it really makes you approach everything that comes at you in lab a different way. There have been times when we've been frustrated and we've spent a lot of hours but we've handled it ourselves—this experiment is a reflection of our own efforts, thoughts and ideas."

Every engineering student completes a senior project, but beyond this, seven distinct programs—as well as funding under individual professors' grants—help bring undergraduate engineering students into the world of research. Students can also seek out unique opportunities such as the iGEM team's experiment, for which their advisor, Assistant Professor Tim Gardner (BME), helped them secure funding from the College, the BME Department and Pfizer, Inc.

In each of the past two years, more than 130 engineering undergraduates participated in research projects outside of class and senior project requirements. Some jump into research as early as freshman year through the Engineering Scholars program, or participate through the Undergraduate Research Opportunities Program. Others are awarded Trustee, Bell and FIRST scholarships, or get Supplemental Undergraduate Research Funds. Some programs are sponsored by outside agencies, like the National Science Foundation's Research Experience for Undergraduates, while ENG alumni make the Summer Term Alumni Research Scholars program possible by donating the students' summer housing costs. During the summer, students work full time on research and typically cut back to about 10 hours per week in lab during the academic year.

"It's very pleasant working with undergrads because their pragmatic, problem-solving approach focuses on delivering products, versus the more long-term research process of the grad students," said Professor Tom Little (ECE), who has two undergraduates working for him. "The students who participate in research labs really get something special they can put on their résumés, and that stands out when they apply to graduate school, internships, co-ops or full-time jobs. They've got a rich experience they can talk about."

Undergrads can face some steep challenges when they set foot in research labs, such as learning advanced technology and techniques, working autonomously and tackling projects much larger in scope than those they are assigned in class. Students who express interest and approach a professor for work—who want to be there—come away with valuable expertise in solving real, long-term engineering problems, said Little.

The iGEM team set out with expansive goals. First, they had to learn how to effectively insert new genetic material into Shewy to control

Student team builds a satellite

not announce a winner until January 2009, giving participants a two-year window to design a device that will hover over the aurora borealis. The measurements and images from the satellite will test an existing computer model of auroras to help better predict space weather that can potentially damage spacecraft electronics and communication networks for cell phones and pagers.

"This is rocket science," said Voss, who competed in the Nanosatellite Competition as an undergraduate at Taylor University. "The 'build-a-satellite-from-scratch' idea really appeals to an engineer's mentality."

In January 2007, Fritz and Voss learned that their proposal was accepted by the Air Force and immediately set about recruiting students for the project, most of whom remain on the team.

Photo right: Aaron DesRosiers, Adrial Wallick and Peter Argue (all ECE'08) talk over the details of their nanosatellite components during a Saturday work session with the team.

"We've maintained a solid core of students who are putting in significant time and energy and really want to do this," Voss said. "We're there to give guidance and act as quality assurance, but the students just took to it and ran with it—finding NASA standards, working together and asking, 'How are you designing this board or that device?'"

Last spring, the students were divided into groups to work on subsystems, such as command and data handling, system housing and attitude control and determination. After a late-semester project concept review, the team decided to work over the summer.

The Air Force provided $110,000 for the project, but most of it was spent on materials, leaving little for student summer wages. Fritz raised another $100,000 from BU faculty and administration that funded their full-time work.

"I never would have thought I'd be building a satellite for the U.S. Air Force," said Chris Calvitto (AME'08). "It's a nice thing to stick on your résumé. We get to design what we want to do, rather than being told exactly what has to happen. It's our satellite."

The group worked throughout the summer building the initial design. In late August, Fritz and a small group of students traveled to the University of Utah at Logan for the mandated Preliminary Design Review before Air Force and industry officials. The 45-minute presentation covered the blueprint and design aspect of the satellite.

"There really weren't too many questions that we couldn't answer," said Calvitto. "We got some good feedback from the Air Force and the general consensus was that it went well. We were a lot further along than some groups."

"The guys who went did a great job," said Fritz, who has joint appointments in CAS and ENG. "A panel of reviewers from industry, academia, NASA and the Air Force was really impressed with their work. It showed them what they needed to do going forward."

With summer gone but the design competition not yet half over, the students realized that their work had just begun. For many, it was an eye-opening first attempt at the research and design aspect of engineering.

"Not only do we have to build a working satellite," said Joe Aghia (AME'08), "but we have to test over and over to make sure what we're doing is actually feasible."

"(The students) never realize that debugging takes just as long as the design work," said Voss. "The hardest part of the whole competition is staying on schedule. The biggest problem the students have is saying, 'No problem, I can get that done.'"

With the blueprint portion of the satellite completed, the team spent the fall preparing for their Critical Design Review (CDR) that will take place this spring, which Voss calls the "biggest review by far." While maintaining their regular class schedule, the students will design and present "breadboards," or oversized working prototypes. Air Force officials will travel to BU to review the proposed satellite.

"For the CDR, you have to prove to the Air Force that what you're doing will actually work," Voss said. "If it's not ready for the CDR, more than likely it won't be ready in time."

During the fall semester, select students, including Erasmo Rodriguez (AME'08)

"You're applying things you've learned in class to real, physical problems."

its metabolism, then alter these genes to create an array of Shewy mutants, each with a different metabolism. The team then needed to identify only those organisms that demonstrated spectacular ability to create electricity, isolate them and put them to work in fuel cells.

This master plan was complicated by Shewy's relative novelty on the research scene; researchers have worked with it for less than a decade. Procedures that are simple and well established with *E. coli*, the ubiquitous bacteria of biological research, can become complicated in Shewy, requiring extended periods of experimentation to find new ways to accomplish otherwise standard tasks. In doing this, the iGEM team ran into one of the fundamental difficulties with biological research—uncertainty.

"Even though we haven't made a lot of forward progress, we've made a lot of lateral progress in terms of finding different ways to do things," said Ling. "Every day when we go in, even if something fails, when we go back and look at our procedure, there's always something we can pick up on. This kind of research really opens up your eyes."

They developed new nuances in how to best work with Shewy and established protocols for procedures that no one had yet perfected in the bacteria.

Another student researcher, Aaron Ganick (ECE'10), works in Little's electrical engineering lab on a video monitoring system that uses very little energy so ecologists can monitor remote areas over long time spans. His new 360-degree hyperbolic mirror lets the camera see in all directions without wasting valuable energy to change its field of view.

"The hardest thing I've done was this hyperbolic mirror," Ganick said. "It took months of looking through documented papers. There are all sorts of equations and differential equations that go along with the mirror profile. I had to search through tons of MATLAB software and find a program to help me make a mirror for the angles we wanted to view. And, it's a very expensive piece, so you really can't screw it up."

Matt Tuttle (AME'09) works in Associate Professor Michael Gevelber's (MFG) materials processing lab refurbishing a vacuum chamber used to test methods of depositing optical coatings using electron beams.

"When I first came into it, I didn't even know what the system was or anything about it. On the first day, they said, 'Here's the chamber. You're going to be getting this thing working.' And I said, 'What is it?' And now, I feel like I could teach a class on e-beam evaporation and vacuum chambers," said Tuttle.

"The best thing is how much I learned doing it," he said. "You're applying things you've learned in class to real, physical problems. When you're doing a book problem, it's set up so you can find an answer a specific way. When you're looking at a real one, which is what you come across in research, there's much more that can happen."

Ahuja, of the iGEM team, agrees. "The main difference I felt working on this research compared to class labs is the bigger picture. For labs, we'd have different steps broken down over a couple of weeks, like a cookbook procedure. But now, with the research, we have to keep all these things in mind—what we've accomplished and why we're doing certain steps."

Teams of 10 to 20 students from across the U.S. and England, Argentina, China and other corners of the globe came to present their work at the iGEM competition at MIT. Most had projects that had been passed on from year to year and from team to team. The BU threesome, undaunted by their small group and rookie status, presented their work with aplomb.

"People really enjoyed it and we drew them in from other presentations. I feel like we're definitely making a positive contribution to this type of research," said Shi.

The BU iGEMers are already back in the lab and will continue working on the project through the 2007–2008 academic year and likely for a second summer as well. They are finding that the experience is shaping their goals and aspirations for the future.

Shi plans to enroll in medical school at BU after graduating from ENG. "I understand that beyond the doctor-to-patient interaction, there are new medical technologies being developed and new medical ideas that are just as important that I may pursue in medical school," he said.

Ganick realized that the work he's done in Little's lab is what he wants to keep on doing. "I really think I'd like to do hardware design and applications with security and vision systems—pretty much exactly what I'm doing here." He's pursuing an internship with the Federal Aviation Administration to work on developing hardware for airport surveillance and security.

The entire experience enriches students, improves their interaction with professors and achieves the ultimate purpose of these opportunities: advancing the research itself.

Advisor Tim Gardner said of the iGEM trio, "They're identifying problems, solving them and exceeding my expectations wildly. They're dynamite."

Photo right: With the hyperbolic mirror he designed reflecting every move he makes, Aaron Ganick (ECE'10) works on his energy-conserving video monitoring system.

From left, Kyle Willis (ECE'08), Erasmo Rodriguez (AME'08) and Chris Calvitto (AME'08) work through the challenges of moving their nanosatellite from a two-dimensional drawing to a three-dimensional prototype (far right).

"In classrooms, you're doing what the professor asks. Here, we're all working together or we're all failing together."

and Avi Gunda (AME'08), traveled to Kirtland Air Force Base in Albuquerque, New Mexico, for a two-day satellite fabrication course sponsored by the Air Force.

"It painted a picture of everything we need to do to make it succeed," Rodriguez said. "One mistake can set you back a long time—something you may not realize until the launch can set you back years."

The design team is learning that every mistake comes with a lesson.

"It's a great opportunity to do hands-on research on a project," Gunda said. "We're really learning things we've never encountered in a classroom."

Spring 2008 marks the midpoint of the two-year competition and the design team still has a long road ahead before it can produce a working satellite. After the CDR, the team faces a Flight Qualification Review in August—which includes the testing of an actual spacecraft—and their final review in January of 2009.

"We have about two years to do this," Voss said. "NASA generally spends five to 10 years building a spacecraft. If we don't have flight hardware by January of 2009, we can't win. The students are not only building it, but training themselves in the proper procedures for building a spacecraft. And they're doing it around their classes."

Regardless of whether the BU entry wins the Nanosatellite Design Competition, the two-year endeavor will ultimately provide students with the type of knowledge, training and experience they wouldn't get in a classroom setting.

"It's great for everything," Voss said. "You learn in these projects how to do the entire research process, which is such a difficult thing to know how to do. That's the purpose from the Air Force standpoint—training the next work force."

Despite long summer hours, some Saturday lab sessions during the semester and the usual pratfalls that come with any research and design, the students agreed with Voss.

"We've had to learn things that haven't been taught to us in class yet," Jonathan Messer (AME'09) said. "Something that should seem pretty simple isn't at all. We've had to go on a few wild goose chases to figure out how to do it."

"I never expected to be working on a spacecraft and actually have something to show for it," said Jeanette Hancock (AME'08). "In classrooms, you're doing what the professor asks. Here, we're all working together or we're all failing together."

And, at the very least, they had an interesting summer job.

"I was explaining to my friends that what I did over the summer was actually rocket science," Messer said. "And should we win, we'll actually be sending something up in space. They were pretty flabbergasted."

By Kate Fink

Aerospace Alum Shoots for the Stars with New Movie, TV Series

Most aerospace engineers hope the public never associates tragedy, doubt and despair with their work. Stewart O'Nan (AME'83), however, thrives on these themes.

O'Nan's career in engineering veered in an unconventional direction in 1993 when he left a job in aerospace engineering to become a writer. He has since written 12 novels, co-written a book on the Boston Red Sox with Stephen King, edited collections of fiction, and now continues his upward trajectory as the stars of Hollywood portray the characters from his book *Snow Angels* in a movie adaptation of the novel.

The book delves into the lives of small-town Butler, Pennsylvania, residents in 1973. Trombone-playing teenager Arthur Parkinson marches through high school as his family crumbles. Parkinson's former babysitter and co-worker at a Chinese restaurant, Annie Marchand, separates from her husband, has an affair and deals with a life in which doors of opportunity keep closing. A tragic death punctuates the end of the story.

The film version debuted at the Sundance Film Festival in January 2007 and opened in limited release in the U.S. on March 7, 2008. Kate Beckinsale stars as Annie Marchand, Sam Rockwell plays her alcoholic husband and Michael Angarano plays Arthur Parkinson.

O'Nan himself steered clear of involvement in the film. The film's director, David Gordon Green, wrote the screen adaptation of O'Nan's novel, making some significant changes in the film version, including pulling the setting forward from 1973 to the present. He also added some humor to make the dark storylines more palatable for audiences.

"For my sanity, it's important that I see the book and the movie as separate works," said O'Nan. "I'm happy that someone felt strongly enough about the book that they wanted to make a movie of it, and I'm grateful they've succeeded."

Even while studying engineering at BU and then working as an aerospace engineer, almost all of O'Nan's spare time was consumed with books.

Author and aerospace engineer Stewart O'Nan (AME'83) and daughter Caitlin (CAS'08) attend Game Two of the 2007 American League Championship Series at Fenway Park.

"I've always been a big reader. The library's my favorite place in the world and has been since I was little. Even when I was working at Grumman, I was reading heavy-duty stuff at lunchtime," he said. "Gradually, I began to spend most of my free time reading and writing. Work all day, drive home, go down in the basement and write, then stay up late reading, wake up the next day and do it again."

Eventually his wife intervened, making him realize he wanted to write more than anything else. He left his engineering job at age 28.

"It's still true 20 years later," said O'Nan. "I'd rather be reading and writing than anything else. Besides being at Fenway, maybe."

The big screen debut of his work may soon be followed by the small screen. His book, *Faithful: Two Diehard Boston Red Sox Fans Chronicle the Historic 2004 Season*, co-written with fellow fan Stephen King, is being developed into a TV miniseries, likely for release in 2008.

New Dean's Catalyst Awards Produce Results

By Jason L. London

Funding the early stages of academic research can be challenging. Innovative ideas for addressing important problems often begin as just that—ideas. The next step is to perform early-stage research to establish proof-of-principle. Often, the more novel or higher risk the idea, the harder it is to attract financial backing. To realize solutions, financial support is necessary. Unfortunately, recent budget cuts at major funding agencies like the National Institutes of Health and the National Science Foundation have made funding increasingly difficult to come by.

To combat this reality and to advance promising faculty research ideas, Dean Kenneth R. Lutchen instituted the Dean's Catalyst Awards in May 2007. The new awards provide seed money for promising interdisciplinary research, allowing projects to get off the ground and generate the kind of initial results that are likely to win grants from major funding agencies.

A faculty committee reviewed 16 proposals submitted by interdisciplinary teams involving 37 faculty members and selected five projects for grants totaling $162,000. The committee apparently chose wisely, as three of the related projects won external funding within six months.

"The Dean's Catalyst Awards are so named because they are intended to catalyze and accelerate high-risk, high-impact research to a point deserving of next-stage funding," Lutchen said. "It's difficult to attract early-stage funding for these types of projects, which are interdisciplinary and lie at the interface of basic and applied science. These awards are an investment in our vision for interdisciplinary research."

Professor Thomas Little, Associate Professor Janusz Konrad and Assistant Professor Prakash Ishwar (all ECE) used the Dean's Catalyst Award to explore the development of a wireless, low-power video sensor network that records a coastal ecosystem and transmits selected information back to a base station for review.

The three are well on their way to achieving their goal—in September, they received a three-year, $450,000 grant from the National Science Foundation to develop a 50-sensor network to observe woodland animals at Boston University's Sargent Camp and study shorebirds and grey seals at a University of Massachusetts Field Station in Nantucket, Massachusetts.

"The Dean's Catalyst Award was instrumental in our being able to create a prototype for the field station—it funded the creation of the sensor network hardware. And based on the availability of the equipment, the NSF was able to award us a much broader project," Little said.

"It can be difficult to get grants because the ideas can be controversial," said award winner Assistant Professor Kamil Ekinci (AME). "They are not super-intuitive. The Dean's Catalyst Awards serve as a proof of concept, [which] often leads to external funding."

Along with Professor Viktor Yakhot (AME), Ekinci is researching the vibration of nanoscale wires in lab-on-a-chip devices submerged in liquid. Their goal is to create devices that work in water without losing the characteristics they exhibit in air. While the concept has been successful in a gas, the DCA grant has allowed them to further their research with extensive water testing.

Since the award, Ekinci and Yakhot's nanoscale work has been published in *Physical Review Letters* and the *Journal of Fluid Mechanics*.

Award-winners Assistant Professor Luca Dal Negro and Associate Professor Robert Kotiuga (both ECE) are aiming to create new strategies for generating and controlling miniature optical fields on nanoscale arrays of metal particles. The creation and manipulation of these highly localized field

Dean's Catalyst Award recipient Tom Little (ECE).

states, which are generated using the mathematical rules of symbolic dynamics, can benefit chemical and biochemical sensors, nanoscale light sources and the creation of optical systems. Their most recent results demonstrated the importance of aperiodic order for the engineering and control within the optical fields.

Since the award, Dal Negro's related work has been published in *Optics Express* and the *Journal of Optics* and has been the subject of a June symposium at Boston University and presentations in Buena Vista, Florida, Capri, Italy and MIT. He was also part of a team that received a $45,000 grant from the Air Force Research Office related to nanoscale measurements and deterministic, aperiodic arrays.

"The Dean's Catalyst Award has been fundamental to boosting all of these ideas," Dal Negro said. "Our most recent results would not have happened without the award—it instigated the interaction between Robert and me, two professors who otherwise would not have worked together."

DCA recipients Assistant Professors Sean Andersson (AME) and Natalia Broude (BME) are following RNA as it roams around a living cell by attaching fluorescent tags that better allow them to watch its movements. Their goal is to improve the technology needed to track RNA and better understand its roles in living cells.

Andersson's work with fluorescent particle tracking led to a three-year NSF grant to develop techniques for concurrently tracking multiple RNA particles under a confocal microscope. The project will also develop algorithms for tracking single fluorescent particles and enable the study of communication and processes between living cells. Andersson and Broude are jointly working on a NSF grant proposal to further their studies.

"The Dean's Catalyst Award is a great idea," Broude said. "The more support the College can provide to the faculty, the better. Governmental support for research in Massachusetts is very difficult to obtain, so a program like this that boosts experimental studies is very useful."

Michael Kohanski, Carrie Lawrence, Professor Jim Collins and Dan Dwyer research bacterial resistance.

BME Researchers Find a Chink in Bacterial Armor

By Kate Fink

Doctors rely on a dwindling arsenal of drugs to fight bacterial infections as the bugs keep finding ways to survive and thrive in hospitals and patients. These "superbugs" might be brought to their knees, however, with BU biomedical engineers' discovery of a previously unknown chain of events that occurs in bacteria when they are fed antibiotics.

The three classes of bactericidal antibiotics used today each target a different bacterial function: inhibiting DNA replication; blocking protein-building; and halting construction of cell walls. But, research from the laboratory of BME Professor Jim Collins has revealed that the three distinct classes are more alike than previously believed—and the commonalities may be the bugs' downfall. Collins and his group published an article on the topic, "A Common Mechanism of Cellular Death Induced by Bactericidal Antibiotics," in the September 7, 2007, issue of *Cell*.

Last year, the National Institutes of Health recognized the promise in Collins' research with a prestigious $2.5 million Director's Pioneer Award. He was one of only 12 researchers among 449 applicants chosen.

Collins and his research team discovered a common process, or pathway, that is triggered by all three types of antibiotics. "There's an underlying pathway beyond the drug interacting with the target," said graduate student and lead author Michael Kohanski (BME, BUMC), "and the endpoint of this pathway is excessive free radical production."

Free radicals, such as hydroxyl or superoxide radicals, are molecules that carry a free—or unpaired—electron like a weapon. "They'll damage DNA, proteins, lipids in the membrane, pretty much anything. They're equal opportunity damagers," said Kohanski.

This hidden pathway and resultant free radical overload can cripple or kill bacteria, and in the future might be employed to help lower antibiotic doses, increase the vulnerability of resistant bacteria to drugs, or develop new antibiotics.

"We showed that if you can inhibit or block the bacterial defense mechanisms to hydroxyl radical damage, you can potentiate or enhance the lethality of bactericidal antibiotics. This highlights the value of taking a network biology approach to antibiotics and provides a framework for creating new classes of drugs," said Collins.

"What we think is happening is the cell is getting a signal that says, 'There's something wrong with our energy production system and we need to make more energy.' But, there's really nothing wrong. The cell becomes confused, turns on too many processes at once, and it's overwhelmed," said Kohanski.

Previous work by Kohanski and co-lead author Dan Dwyer (BME) revealed the first hints that this underlying pathway exists. In studying the bacterial response to a quinolone, an antibiotic that inhibits DNA replication, they noted a surprising change in genes responsible for energy production and iron uptake.

In the *Cell* publication, the researchers used DNA microarray studies to see if all three classes of bactericidal antibiotics triggered this process. Across the board, they noted increased activity along the intracellular assembly lines that make energy for the bacterial cell, just as in the earlier study. They began to deduce the details of the new pathway.

Cells produce free superoxide radicals naturally in oxygen-rich environments, but when they unnecessarily ramp up energy production to a frantic pace—such as when they are triggered by antibiotics—more radicals get churned out than the cell's safety measures can mop up. The superoxide radicals then pull iron from other components of the cell, and this iron rapidly stimulates production of toxic levels of hydroxyl radicals.

"It's really amazing that despite the diversity of targets, you have everything funneling into this common pathway where there's a global meltdown occurring," said Dwyer. "There's almost no way for the cell to recover from this. It shows you how potent these molecules are to damaging and killing the cell."

In addition to potentially making bacteria more vulnerable to current drugs, this finding may revitalize development of antibiotic drugs sidelined because of narrow differences between therapeutic and toxic doses. Such drugs might re-enter the pipeline, if this free radical-producing pathway is exploited to lower the therapeutic dose and make formerly dangerous drugs safer.

Under a Microscope, AME Professor Speeds up the Nanoscale

By Jason L. London

Kamil Ekinci

A group of investigators led by Assistant Professor Kamil Ekinci (AME) has developed an inventive technique that will allow researchers to collect nanoscale microscopy images roughly 100 times faster than current state-of-the-art scanning tunneling microscopes. The findings, published in *Nature*, present a modification of the 25-year-old traditional microscopy technique that remedies the slow pace and limited high-frequency response of current microscopy circuitry.

To achieve atomic-scale spatial resolution at the nanoscale level, traditional scanning tunneling microscopy (STM) relies on localized electron tunneling between a sharp probe tip and a conducting sample. In this technique, the tip is brought to within a few angstroms of the sample surface and an electrical current is drawn and measured between the tip and the surface.

While traditional STM has produced a wealth of discoveries in many diverse physical systems, the technique has visual limitations.

"In traditional STM, the electrical current between the tip and the sample needs to be boosted up by a large amount because it is very tiny," Ekinci said. "But when you boost up, there is trade-off—you lose temporal resolution and bandwidth, which means you cannot detect fast signals."

Ekinci's group, which includes Boston University graduate student Utku Kemiktarak (CAS'09), overcame the shortcoming by increasing the high-frequency response of the tunnel current's readout circuitry. The new higher-frequency results demonstrated electronic bandwidths as high as 10 megahertz—a 100-fold improvement over traditional STM.

"In our approach, we were able to eliminate the problems introduced by the boosting process by attaching an impedance matching circuit to the probe tip," Ekinci said. "This opened up a usable bandwidth which resulted in good temporal resolution. While the technique itself is quite simple, this is the first time it is applied to STM."

The new technique enables fast surface imaging, which was previously difficult because of the resolution loss and the decrease in bandwidth.

"With regular STM, it was hard to do fast surface scans because you would not be able to see the images," Ekinci said. "If you went too fast with scanning, everything would be blurred out. Our technique has allowed the circuit to become responsive to fast changes."

In addition to collecting rapid-paced imagery, the new technique will act as a motion detector at high frequencies and measure the noise of the tunneling electrons, the latter of which is very important for the detection of temperature on the sample surface.

"We'll be able to use our tip on the surface to measure the temperature," Ekinci said. "This is a very important feature for high-tech integrated circuits. By extracting temperature for the surface, it will allow us to see which areas in a circuit may be hotter than others."

New Energy Club Gains Steam

By Kate Fink

To start an energy club at BU, graduate student Elijah Ercolino needed people. He found his first fellow energy enthusiast on March 9, 2007, when he met doctoral student Peter Zink at an energy conference in Cambridge, Massachusetts. A year later, the BU Energy Club has more than 130 members.

"We're bringing people out of the woodwork and getting them together," said Ercolino. "There was general interest here, but it took this group to start people talking about things—get ideas going—and we just ran with it. We want to be a catalyst."

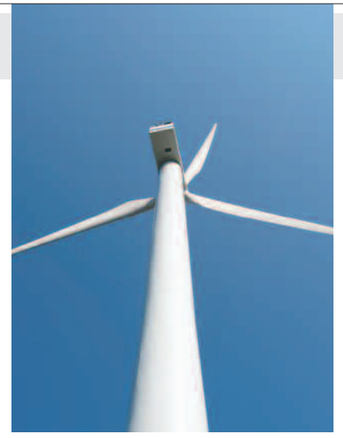
Early in his search for members, Ercolino, a master's degree student in mechanical engineering, realized the club should include people with many different approaches to energy issues. He recruited Katie Schu, a graduate student in BU's Center for Energy and Environmental Studies (CEES), now a club vice president representing the College of Arts and Sciences. Graduate School of Management student Angus Shaw found his own way across Commonwealth Avenue to Ercolino's group and became a vice president representing GSM.

"It's been great to get CEES and the management students and engineers to make something bigger than any one of the three pieces could be on their own," said club president Zink, who worked in finance before getting started on his manufacturing engineering Ph.D. He now researches fuel cell technology in the laboratory of Professor Uday Pal (MFG), the club's primary advisor. Professor Robert Kaufmann (CAS) and Assistant Professor Nitin Joglekar (GSM) also advise the club.

"It is clear that Boston University has numerous top-notch educational and research programs in the area of clean energy," said Pal. "This club will promote collaboration among students interested in various aspects of energy technologies throughout Boston University. Students will increase awareness at BU and in local communities about environmental issues such as global warming, pollution and resource depletion. These issues will dominate all aspects of our life, and availability of clean energy will be essential for both sustainability and prosperity."

With their initial goal of building a community well on its way to being realized, the group is now poised to explore their many and varied energy-related interests and work together on a broad spectrum of projects.

The Energy Club invites guest speakers to campus to discuss topics ranging from the social aspects of energy—such as ride-sharing services—to the technological aspects, such as solar power innovations. It also organizes informal discussion groups and social events, goes on field trips (in September, a



group visited the Hull, Massachusetts, wind turbine) and participates in industry-sponsored contests including the Ignite Clean Energy business presentation competition, which features a $200,000 prize.

The club also offers professors a way to get student input and assess interest in new energy-related classes, including one to follow up on a recent energy audit of BU that will further analyze and act on specific ways to improve energy efficiency at the University.

For more information, visit the Energy Club website at http://people.bu.edu/buenergy/.

Follow-up: Engineers Without Borders Students Visit Peru

By Kate Fink

A flight to Lima followed by a precarious, 28-hour ride over mountain roads landed five students in the remote town of Chirimoto, Peru, this past January. The group—a contingent from the BU Engineers Without Borders chapter—visited the town to assess the needs of its residents and determine how to help improve living conditions there.

"We all went into it not knowing what to expect, but it was really successful. As an assessment trip it really served its purpose because it opened our eyes to what the real possibilities are and gave us a new perspective on potential areas to work in," said Julia Delogu (AME'09).

This is the first project for the BU chapter of this national nonprofit organization. Formed in October of 2006, the chapter worked to meet fundraising goals throughout the Fall 2007 semester for its initial trip to Chirimoto, a remote village in northern Peru that has yet to fully recover from devastating floods that struck the area three decades ago. Typically, EWB chapters visit an area at least twice for a project; first, they take an assessment trip, then—six to eight months later— implement the project.

Chapter President Chris Spring (AME '08) and group members Delogu, Paulo Belfiore (BME'09), graduate student Emily Johnson (SPH'08) and Ramona Georgescu (ECE'07) made the two-week journey accompanied by Chirimoto native Luis Chavez, a doctoral candidate in romance languages.

To test the feasibility of installing a water purification system or providing solar power, the students performed basic water-quality tests on rivers that provide the town's drinking water and measured solar radiation using a pyronometer. The EWB members also wanted to ensure that their project would fill a real need for the townspeople, so they talked to residents in a town meeting, a women's meeting and individual interviews.

Since returning to Boston, the group has begun evaluating this information and is considering some new ideas brought up in conversations with Chirimoto residents, such as helping the town's coffee growers further process their beans to get a better price for them.

Just before departing, the group also met with a regional government official.

"If we're able to implement a project that proves beneficial, such as a water purification system, they would be interested in using our design and our research to implement the system in other parts of the region, which we're really happy about," said Spring.

The group will research potential projects and consult experts this spring to decide what project will most benefit Chirimoto. The students will continue fundraising and plan the project's logistics in anticipation of a return trip to Chirimoto this summer.

"I really hope that just by our going there, we planted the seed that there's someone who cares and that whatever project we do can help as many people as possible," said Delogu. "And we're going to do it with them, with their help. I think whatever we do, everyone's going to be appreciative and say, 'OK, what else can we do together?'"

For more information, please visit the BU Engineers Without Borders website at http://people.bu.edu/ewbexec/.

ECE Design Team Places at National Competition

By Jason L. London

A Boston public school for students with intensive special needs and cognitive disabilities can now continually interact with its students thanks to a new "personal greeter" device created by a 2007 ECE senior design team.

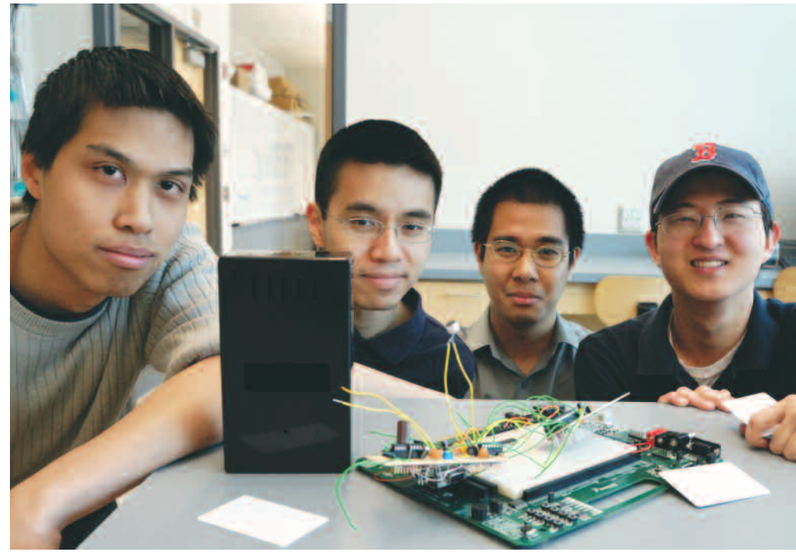
Using digital voice recording and radio frequency identification (RFID) technology, the student team worked closely with staff at the William E. Carter School to create unique personal messages up to six seconds long that can be relayed individually as each student moves throughout the school. In time, the device could also be used to remind students when to take medication, notify them when they are leaving a specific area, and alert Carter School staff when a new student has entered a room.

The design team—2007 graduates Victor Bartolome, David Huynh, Kyle Martin and Jerry Lam—entered the project in the national Rehabilitation Engineering Research Center for the Advancement of Cognitive Technologies (RERC-ACT) Student Design Competition and won the second-place prize.

"We were able to go to the school and meet with the teachers and students," said Martin, who traveled to the University of Colorado at Boulder in October to present the device and accept the award. "The students needed something more personalized and familiar. That's hopefully what our project gave them."

In addition to the digital voice recording and RFID interface, other major

From left, David Huynh, Jerry Lam, Victor Bartolome and Kyle Martin (all ECE'07)



obstacles stood in the way of producing a working system. The senior design team had to determine potential safety hazards, power sources and even the average height of a student and/or their wheelchair to establish the best location for the device.

"Our major challenge was to determine each particular engineering requirement for the system," Martin said. "We had to ask ourselves, 'How do we refine the requirements and set a good engineering design?'"

The ECE team split the project into three parts: RFID, voice recording and audio playback. Each aspect had to work in synch with the others to enable the working device.

"We had to apply knowledge from all of our courses," Lam said, "even freshman year. Microprocessing, electronics—there was a little bit everything."

The design team was unaware of the RERC-ACT contest until late in the spring semester. In order to complete their requirements for the competition, the team volunteered its time on the project and worked into the fall semester.

"Knowing the senior design course was over, these guys worked further on it on a volunteer basis," said Professor Mike Ruane (ECE), who helped oversee the Senior Design course. "Their preparation for the conference in October was well beyond the realm of the course."

A group of cognitive disability specialists, engineers, and computer scientists judged each project on four criteria: design specifications; significance of impact; breadth of impact and likelihood of success; and availability. The Boston University group finished ahead of schools such as Georgia Tech, Vanderbilt and Arizona State University en route to their second-place finish behind Carnegie Mellon University.

"This proved to me that BU engineering is top notch," Martin said. "It was rewarding to hear that from the judges."

Dr. Rakish K. Jain

Boston University Hosts Optical Imaging Seminar

By Jason L. London

The application of optical molecular imaging to cancer research is expanding rapidly but faces daunting scientific and industrial challenges. New directions in optical imaging technology as applied to cancer diagnosis and therapy were discussed at a gathering of academic, industry and research leaders at the Photonics Center last November 30.

The event, "Optical Imaging for Medicine and Biology: Applications in Cancer Detection," was sponsored by the College of Engineering's Emerging Technology and Best Practices Seminar Series. Hosted by Professor Jerome Mertz (BME), the symposium focused on issues including the importance of stabilizing tumor vessels, bench-to-bedside patient care and the long-range forecast of eradicating colon cancer.

Karen H. Antman, dean and provost of the School of Medicine, discussed the current and future clinical application of molecular imaging to cancer. Her talk touched upon the different options of detecting cancer though MRI, hypoxia imaging, theragnostics and nanotechnology.

"There are major advances in imaging technology each year," Antman said. "Going forward, the most important of these we need to facilitate are evaluating and lowering the cost of the development of new drugs and continuing to standardize imaging."

Speakers included Rakish K. Jain, professor of tumor biology at Harvard Medical School, and Satish K. Singh, assistant professor of medicine at the BU School of Medicine. Jain discussed the accelerated bench-to-bedside efforts to study cancer growth and the effects of oxygen and fluid on tumors. Singh spoke about common misconceptions about colonoscopy, stressing the demand for more trained colonoscopists, the rationale for screening strategies and different techniques that may improve the detection of lesions.

Other topics covered throughout the day included novel strategies in endoscopic imaging, using preclinical models to study cancer growth, whole-scale microscopy techniques and spectroscopic detection based on fluorescence and scattered light.

The next Emerging Technology Seminar, in April 2008, will focus on the application of nanoparticles and nanostructures in health care. The seminar will be held at the College of Engineering and co-hosted by the College of Engineering and the School of Medicine. For more information, including a list of speakers and online registration, visit www.bu.edu/eng/etseminar.

BU, Consortium Award First Graduate Student Fellowships

By Kate Fink

A new partnership between the College of Engineering and a Boston-based consortium of biomedical and healthcare institutions began in November with the awarding of three graduate student fellowships.

"We are pleased to be teaming with Boston University on this valuable grant program," said John Parrish, director of the Center for Integration of Medicine and Innovative Technology (CIMIT). "Our goal is to develop better healthcare for patients, and aiding motivated students in their research is an important step in that process."

The inaugural fellowship winners, doctoral students Pui Leng Leong (BME) and Burkay Birant Orten (ECE) and master's degree student Jane Yuqian Zhang (BME), each received an award of $55,000 for research and $500 for travel to present their research at a national meeting.

"We consider this fellowship a great opportunity for our students in this emerging area of healthcare research," said Selim Ünlü, ENG's associate dean for Research and Graduate Programs. "Working with CIMIT will allow our students to pursue the applications of innovative engineering discoveries in translational medicine—an area of significant importance to the College."

CIMIT
Center for Integration of Medicine & Innovative Technology

The BU/CIMIT Applied Healthcare Engineering Fellowship is awarded to second- or third-year graduate students researching topics that help solve healthcare challenges such as medical device development, creating algorithms and software for use in clinical practice, and engineering in medical environments. The fellowships are awarded for one year with the potential to renew for a second year.

CIMIT is a nonprofit consortium of Boston-area teaching hospitals and engineering schools. It provides innovators with the resources to explore, develop and implement novel technological solutions for today's most urgent healthcare problems.

Research Focuses on Getting Wireless Networks to Fix Themselves

By Jason L. London

The National Science Foundation has awarded Professor Christos Cassandras (MFG), Associate Professor Ioannis Paschalidis (MFG) and Professor Azer Bestavros (CAS) a four-year, $2 million Emerging Frontiers in Research and Innovation grant to advance the reconfiguration of autonomous networks after unexpected system errors.

The researchers plan to develop software that allows a network to reset itself after unexpected problems or sudden changes in conditions. The main test bed will be OpenAir Boston, a nonprofit organization that will oversee Boston's planned city-wide wireless network.

"This is an excellent complement to our objectives," Pamela Reeve, OpenAir Boston chief executive officer, said. "It will play a crucial role in creating a responsive, self-adjusting enterprise."

"The goal is to develop networks that can automatically reconfigure themselves," Cassandras said. "If a transceiver breaks down or a battery runs out, the network will reconfigure itself without anyone physically correcting the problem."

Applying this research to an urban environment like Boston impressed the NSF, Cassandras said.

"A test bed throughout Boston is a unique idea," he said. "It is different and ambitious, as is the collaborative effort of Boston University and a private industry like OpenAir Boston."

Because OpenAir Boston will initially incorporate only basic wireless capabilities, a reconfigurability feature will be added that incorporates extra intelligence otherwise difficult to do with fully operational wireless networks.

Christos Cassandras

"This will make the design robust from the beginning," Cassandras said. "Retroactively imparting extra data to any system is difficult. This allows for a much better chance of success."

The Center for Information and Systems Engineering (CISE), a systems engineering team made up of faculty from ENG, CAS and SMG, will facilitate the collaboration.

"This is another success story for CISE," Cassandras said. "Our hope is that Boston University and CISE become the core of Boston's wireless network."

Ron Roy Named AME Chair

By Jason L. London

College of Engineering Dean Kenneth R. Lutchen has named Professor **Ronald Roy** chairman of the Aerospace and Mechanical Engineering Department, a position Roy had held on an interim basis since August.

The selection represents Lutchen's first appointment of a full-term department chair since he assumed deanship of the College in 2006.

"It is a pleasure and an honor to announce Ron Roy's appointment as the next chair of AME," Lutchen said. "I received an outpouring of excitement regarding support for Ron as the next chair. He has an extraordinary record of accomplishments and impact in research, in funding, in education and in service to Boston University and the profession."

Roy's three-year appointment will coincide with the planned merger of the AME and Manufacturing Engineering departments. Upon completion, Roy will be chairman of the newly merged department.

"I'm looking forward to the new position," Roy said. "Merging departments will be a complex, multifaceted process. Our long-term goal is to advance the quality of academic life within the department and to increase our visibility and impact nationwide. More immediate objectives include the formulation of a merged undergraduate degree program that offers both depth and breadth to go along with an expanded graduate program and faculty research portfolio."

Roy joined AME as an associate professor in 1996 and was promoted to full professor in 2002. He believes his familiarity with both the AME and College of Engineering communities will facilitate a smooth transition and that recent successes in faculty recruitment will serve as a launching pad for the department's further development and growth.

"When you have the support of, and a connection with, the people around you, it makes everything much easier," he said. "John Baillieul, Tom Bifano and Uday Pal did a great job recruiting some top-quality junior faculty who are now coming into their own. That's going to be the foundation upon which the department will rest."

Roy spent the 2006–2007 academic year as the University of Oxford George Eastman Distinguished Visiting Professor. Prior to his arrival at Boston University, he held faculty positions at the University of Washington and the University of Mississippi. His work in the engineering industry includes a research scientist position for the National Center for Physical Acoustics and director for research and development for Apfel Enterprises, focusing on developing new technologies for radiation monitoring.

His research specializes in the application of physical acoustics principles to problems in biomedical acoustics, industrial

Ronald Roy

ultrasonics and acoustical oceanography. Roy is a fellow of the Acoustical Society of America. He is also a member of the American Society of Mechanical Engineers and the International Society of Therapeutic Ultrasound and a past member of the European Society of Sonochemistry and the American Institute of Physics.

Roy holds a bachelor's degree from the University of Maine at Orono, master's degrees from the University of Mississippi and Yale University, and a doctorate from Yale University.

Acoustical Society of America honors Professor Porter

By Jason L. London

The Acoustical Society of America has awarded Assistant Professor **Tyrone Porter** (AME) the 2008 R. Bruce Lindsey Award for outstanding achievements in acoustics.

According to the ASA, the annual award is presented to "a member of the society under 35 years of age who, during a period of two or more years immediately preceding the award, has been active in the affairs of the society and has contributed substantially, through published papers, to the advancement of theoretical or applied acoustics, or both."

Porter will receive the award at the society's meeting in Paris this summer.

"Tyrone is one of the ASA's rising stars," AME Chairman Ronald Roy said. "He brings energy and leadership to all ASA administrative, research and academic activities. Tyrone is highly regarded by his peers and this recognition is richly deserved."

A member of the AME faculty since 2006, Porter's acoustical work and research has focused on investigating the behavior of ultrasound contrast agents in acoustic fields, the development of ultrasound-triggered drug carriers for targeted drug delivery applications, and the effects of oscillating bubbles on cell membrane permeability. His work in these areas has concentrated on eroding or eradicating diseased cells—such as cancer cells—with minimal or zero damage to the healthy cells in the area.

"When the president of the ASA called, I was at a loss for words," Porter said. "It came as a real surprise. Someone from within the ASA nominated me for the award. The phone call came as a real shock."

This is not Porter's first honor in acoustic achievement. During the 2003–04 year, he received the ASA Frederick V. Hunt Postdoctoral Fellowship as a doctoral student at the University of Washington. His dissertation focused on investigating the connection between ultrasound and membrane disruptive polymers and their effect on cell membranes.

His acoustical work has been published in numerous journals, most notably "Control of cavitation-induced hemolysis with a surface-active polymer" in *Acoustics Research Letters Online* (2005) and "Acoustic techniques for assessing the Optison® destruction threshold" in the *Journal of Ultrasound Medicine* (2006).

Porter is the third AME faculty member to receive an acoustical award in the past year. Professor William M. Carey was awarded the 2007 Pioneer of Underwater Acoustics silver medal by the ASA in June and Professor Allan D. Pierce received the 2007 Stanley Ehrlich Gold Medal from the Acoustical Foundation for Education and Charitable Trust of India in September [see story below].

"Acoustical achievement is most definitely one of the strengths of the AME Department," Porter said.

Tyrone Porter

Pierce's Work in Acoustics Earns Him International Award

By Jason L. London

The Acoustical Foundation for Education and Charitable Trust (AFECT) of India selected Professor **Allan D. Pierce** (AME) as the recipient of the 2007 Stanley Ehrlich Gold Medal for his contributions to physical, environmental and structural acoustics, and acoustics education. In conjunction with the award, Pierce presented the Stanley Ehrlich lecture at the 2007 National Symposium on Acoustics in Tiruchengode, India.

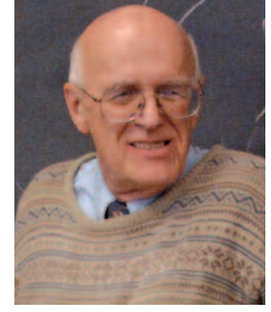
According to AFECT, the Gold Medal is presented to an eminent acoustician or surgeon, irrespective of nationality, age, or society affiliation, to promote international brotherhood in the diverse field of acoustics.

"It's an honor to receive this award," Pierce said. "Foreigners receive this medal only every so often. They could have picked anyone and they chose me."

Pierce is only the third American to receive the AFECT award. As editor-in-chief of the Acoustical Society of America, Pierce became familiar with acoustical activity and research in India when the country became home to the first ASA chapter outside the U.S. He was nominated for the award and lecture by AFECT President Hari Paul.

"This award allows me to learn more about India and international relations," said Pierce. "Acoustics are a strong, emerging area in the country."

Over the course of his career, Pierce's diverse acoustical interests have blended physical insight and mathematical rigor. His early research focused on determining the magnitude of an explosion by its measured waveform, which was used to verify the ban on atmospheric testing of nuclear weapons and estimate the magnitude of eruptions on Mount St. Helen's. He has been recognized for research in laser generation of sound and diffraction around thick barriers and is studying sound propagation in the ocean with fellow AME Professor William Carey. His book, *Acoustics: An Introduction to Its Physical Principles and Applications*, is one of the best-selling ASA books.



Allan Pierce

The Gold Medal is the most recent in a long line of acoustical awards received by Pierce. The ASA awarded Pierce a gold medal in 2005 and a silver medal in 1991. He was the first recipient of the Rossing Prize in Acoustic Education in 2004, and was awarded the Per Bruel Gold Medal for Noise Control and Acoustics in 1995, and the Senior U.S. Scientist Award from the Alexander von Humboldt Foundation in 1976.

Baillieul, Meller Win Inaugural Faculty Awards

By Jason L. London

The College of Engineering has established two new annual awards to recognize faculty members engaged in high-impact research. Professor **John Baillieul** (AME) has been awarded the first Distinguished Lecture Series Award and Associate Professor **Amit Meller** (BME) is the inaugural Early Career Research Excellence Award winner.

The Distinguished Lecture Series Award honors a faculty member engaged in outstanding research and gives the recipient a public forum to discuss and showcase that research. Baillieul chose the topic, "Control Theory, Networks and Life Itself," for his lecture.

Baillieul's research deals with robotics, control of mechanical systems and mathematical system theory. A sought-after public speaker, he has served as editor-in-chief of *IEEE Control Systems Society*, *IEEE Transactions of Automatic Control*, *Society for Industrial and Applied Mathematics and the Siam Journal for Control Optimization*.

"John is of the most influential intellects recognized both nationally and internationally in his field," said Professor Hue Weng (AME). "His academic and professional achievements have been recognized by his peers in the highest forms."

The Early Career Research Excellence Award celebrates the recent research accomplishments of tenure-track faculty within 10 years of completing their PhD.

Meller's research has focused on rapid, inexpensive DNA sequencing, RNA folding kinetics and genetic regulation. His collaborative research with Associate Professor Zhiping Weng (BME) aims to reduce the cost of genome sequencing.

John Baillieul

Amit Meller

"Amit has played an integral service role in the BME Department," said Professor Solomon Eisenberg, the BME chairman ad interim. "As the first award winner, he has set the bar very high in terms of the level of research achievements and general good citizenship that this award recognizes."

Altug Selected as Peter Paul Career Development Professor

By Jason L. London

Boston University selected Assistant Professor **Hatice Altug** (ECE) as a 2007 Peter Paul Career Development Professor. The professorship is awarded to elite, young Boston University faculty, irrespective of college or discipline, in their first two years of appointment at Boston University. Recipients are nominated by their deans and selected by the president and provost. The three-year professorship provides $50,000 annually towards salary and research.

"Our department is delighted about Professor Altug's selection," ECE Chairman David Castañón said. "This will provide valuable resources to enable her to continue her groundbreaking work and develop new collaborations."

Altug joined the College in January of 2007 after receiving master's and doctoral degrees from Stanford University and her bachelor's from Bilkent University (Turkey).

Altug's research involves the design and implementation of ultra-compact nanophotonic devices and sensors. Her demonstration of the world's fastest on-chip semiconductor laser appeared on the cover of the July 2006 *Nature Physics*. Her work has also appeared in *Nature Photonics*, *Laser Focus World Magazines*, *Photonics Spectra* and the *IEEE LEOS Newsletter*.

Hatice Altug

She was also awarded best research paper at the November 2006 IEEE LEOS Conference and received the October 2005 IEEE LEOS Research Excellence Award.

BU hockey versus BC, December 1, 2007

Alumni gathered at Agganis Arena to reconnect with friends and attend the BU hockey game versus archrival BC.

Photos top left to right:

Robert Jedzinak, Paula Jedzinak, their daughter Katherine Greaney ('00), and her husband Mike Greaney

John Keeter, Bill Neifert ('90, '92), Elijah Marantette (CAS'93), Steve Foraste ('91) and Assistant Dean Rich Lally

Middle Photo:

Lisa Campana ('06) and Heather Rasich ('06)

Photos bottom left to right:

Isabel Pisano (MET'87) and Adjunct Professor Alan Pisano (ECE)

Chris Antonowich (MET'07), Jeff Harrington ('03) and Natasha Lewin (SMG'07)

AlumniEvents

Dean's Reception, October 17, 2007 at the BU Club

Photos top left to right:

From left, Dave Lancia ('02, '04), Ruth Hunter ('64) and Al Muccini ('64)

From left, Tony and Cathy Giordano, parents of Nicholas Giordano ('11), and Cameron and Michael MacDonald, parents of Michael MacDonald ('09)

Middle Photo:

From left, Jamie Heller, Karen Panetta ('85) and Geraldine Muccini

Bottom Photo:

From left, Andrea Laforme, Tom DiCicco ('01), Mike Keefe ('89), and Peter Cirak ('01, '07)

ClassNotes

What are you doing?

We want to hear from you! Send your class notes submissions to engalum@bu.edu.

1982

Michelle Tortolani, B.S.'82, M.S.'89
Alexandria, Virginia
Michelle was installed as the 45th president of the Society of Women Engineers at a ceremony in Bethesda, Maryland, last August. Michelle is the senior director of repeater engineering and operations at XM Satellite Radio in Washington, D.C.

1984

Eric Hernandez, B.S.
Topeka, Kansas
After working for General Motors and Innovia Films, Eric now works at Goodyear, where he is responsible for maintaining about 40 percent of the plant. "I can now say that I am truly happy to be back in the automotive business," he writes. "Alcira and the boys have settled well into their routines."

1985

Karen Panetta, B.S.
Medford, Massachusetts
Karen, chair of the Women in Engineering Committee at the Institute of Electrical and Electronics Engineers, launched the premier issue of a new IEEE publication in January of 2008, *IEEE Women in Engineering*. An interactive pdf of the magazine is available online (http://www.ieee.org/portal/cms_docs/committee/women/13350.pdf) and includes articles and profiles relating engineering to current issues, careers, health care, medicine, law and governance. The committee Karen leads includes more than 12,500 members and supports women in engineering careers as well as those considering the field.

1987

Edward Cook, B.S.
Baghdad, Iraq
Edward works in the Health Attaché Office of the American Embassy in Baghdad. "My focus is building the capacity of the ministry of health's ability to deliver services to Iraq," he writes. His goals are getting Iraqi doctors to return to work at clinics and hospitals, building the emergency medical systems and helping Iraq develop a comprehensive health-care strategy.

1989

Celia (Ketley) Leber, B.S.
Bend, Oregon
Celia and her husband co-own a bicycle touring company—learn more at www.wildheartcycling.com.

1992

Matthew Magne, B.S.
Wilmington, North Carolina
Matthew recently joined IBM as a senior IT specialist in technical sales for the company's Master Data Management Solutions; he previously ran his own software company. Matthew is pursuing his M.B.A. at the University of North Carolina in Wilmington, where he has lived for four years with his wife, Kristin, their seven-toothed one-year-old, Lukas, and their two dogs, Buddha and Bella. Contact him at mkmagne@us.imb.com.

1994

John A. McNeill, Ph.D.
Stow, Massachusetts
John, an associate professor of electrical and computer engineering at Worcester Polytechnic Institute, was one of two faculty members to receive the inaugural Chairman's Exemplary Faculty Prize at WPI's 2007 commencement exercises. John, who earned a Ph.D. in electrical engineering at BU, was honored in part for his research in mixed-signal integrated circuit design.

1995

Brian Anderson, B.S.
Monterey, California
Brian, a major in the Marines, attends the Naval Postgraduate School and will graduate in September 2008 with master's degrees in Space Systems Operations and Applied Physics. He and his wife Angi Anderson (CAS/SED'96) have two boys, Charles, 6, and Samuel, 4, who keep them busy, and the family loves the Monterey Peninsula. Brian and Angi speak often and fondly of their days at BU and would love to hear from old friends. E-mail the Andersons at angitwo@gmail.com.

1998

Jason Ulberg, B.S.
Swampscott, Massachusetts
Jason and Jaime (Ruyack) Ulberg (SMG'98) announce the birth of their first child, Charlie Topher, on July 8, 2007.

David Yeh, B.S.'98, M.S.'01
Austin, Texas
David and Jenny Wu (SMG'98) were married on December 17, 2005, in Hong Kong. In attendance were Faye Liu (CAS'01, CGS'99), Eric Yu (CAS'99), Alle Siu (CAS'98), Kelvin Law (ENG'98), Ming Chen (CAS'98), Aviva Chow (SHA'98), Edmund Chau (SMG'97), Dickson Chan (CAS'00), Angela Chien (CAS'98), Kevin Chan (ENG'98), David Huang (GSM'02), Florence Lin (SHA'99) and Angelie Shek (CAS'99). David is the product marketing manager at Silicon Laboratories. You can contact the couple at jwudyeh@yahoo.com.

1999

Jay B. Hancock, B.S.
Pickering, Ontario
Jay's incorporated company, Kibbles Software, Inc., builds business process automation software for small and medium businesses, helping to "provide integrity where humans tend to be forgetful or produce errors, and save expense and time," Jay writes.

Herbert Lun, B.S.'99, M.S.'02, GSM'02
Kowloon Tung, Hong Kong
Herbert and Tracy Law (COM'99) proudly announce the birth of their first child, Ethan James, on September 22, 2007. Contact them at htklun@yahoo.com.

2002

Liberty Gunter, B.S.
Dunbarton, New Hampshire
Liberty was named the Outstanding New Hampshire Young Engineer for 2007 by the Institute of Electrical and Electronics Engineers (IEEE). Liberty joined BAE Systems in 2002, where she works in electrical engineering and semiconductors and volunteers as a mentor in the company's Women in Technology program for high school students. She also works with the FIRST Robotics program and the LEGO League.

Jason Light, B.S.'02, M.S.'04
Dupont, Washington
Jason married Samantha Nagle on August 18, 2007, in Bellingham, Washington.

2003

Earl Valencia, B.S.
Stanford, California
Earl is pursuing a master's in business administration at the Stanford Graduate School of Business starting in the fall of 2007 and says he is unfortunately the only BU alum in his class. Earl is on educational leave from Raytheon, where he is a senior systems engineer and a graduate of their Engineering Leadership Development Program. He would like to reconnect with former classmates, professors or any Bay Area alumni. Contact him at earlv@stanford.edu.

2004

Wenyuan Chen, B.S.
Cumberland, Rhode Island
Wenyuan, of Cumberland, Rhode Island, has been project manager of Servo products at AC Technology Corporation, a member of the Lenze Group, since October 2005. Wenyuan and his wife, Xuzheng Wang, welcomed their second child, Victoria (Jianchen) Wang on January 4, 2008. Their son Charlie is 3 years old. E-mail them at wychen@alum.bu.edu.

Nicholas Pratt, B.S.'04, M.S.'06
Manchester, Vermont
Nicholas married Jasmine Marrero-Pratt (CAS'04, CGS'02) on October 20, 2007. Charlene Kjobstad (CAS'04) attended the wedding.

Jonathan Weiss, B.S.
Waltham, Massachusetts
Jonathan married Katherine Lochbrunner (CAS'02) in Kauai, Hawaii, on July 15, 2007. The couple resides in Waltham, Massachusetts.

By Jason L. London

In Memoriam: Moe Wasserman

On November 4, 2007, the College of Engineering mourned the loss of longtime faculty member Moe Wasserman, who, for more than two decades, left his mark on students and colleagues as an outstanding teacher and researcher.

Wasserman joined the faculty in 1983 while still working at GTE Laboratories (he received the company's Leslie Warner Technical Achievement Award the following year). By 1987, he was working at BU full time as an associate professor and won the University's Outstanding Engineering Professor of the Year Award in 1992. He retired in 1997, although he continued as professor emeritus until his death.

Professor Mark Horenstein (ECE) was a colleague of Wasserman's and knew him well. He delivered the following eulogy at Wasserman's funeral.

I had the pleasure of working with him throughout his second career at Boston University, from his initial hiring as an adjunct professor in 1983 until his official retirement in 1997. We taught courses together, wrote books together and shared family events. He mastered the art of balancing work and family. For my wife and me, Moe and Jo served as one of our most trusted role models as we navigated the turbid waters of raising children.

A more dedicated teacher one could never find. In 1987, when our first new engineering building had only unofficially opened, I caught Moe climbing seven long flights of stairs because the elevators had not yet been activated. Even at that time, respiratory problems had begun to plague him.

"Moe, what are you doing?" His response: "I have to set up my new office. Classes will be starting soon. I need to be ready."

Moe was the first faculty member to officially retire from the Department of Electrical and Computer Engineering at Boston University. To him, "retirement" was but a sign to spend more time with family, but the call of teaching continued to beckon him. For years thereafter, he taught occasional courses as well as regular summer term. As late as last year, Moe inquired about teaching yet another course while tethered to his oxygen tank. "I'll be fine" he said to me one day in the mail room. "The tube is definitely long enough. I miss teaching."

Moe Wasserman

Moe was held in esteem by all of his colleagues. None can ever recall him being anything but cheerful, optimistic and dedicated to his profession. When his passing was announced to the faculty, many offered their thoughts of remembrance. I share these with you now, along with several student comments gleaned from his teaching evaluations over the years.

First, from his student-teacher evaluations just before his official retirement:

• He is always well prepared, very interested in the material and knowledgeable. He clearly loves teaching.

• He is always willing to meet with students outside of class. His teaching style is intimate, and he always encourages discussion and questions. He is very concerned that students understand the material.

• His clarity of presentation is outstanding. He is perhaps the best instructor I have had at Boston University.

And from some of his faculty colleagues:

• I am saddened by the news (of his passing). I will remember Moe as a kind, gentle man who was always ready to contribute with a helping hand. He was a wonderful person who did a great many things for the school.

• Although I knew him only briefly, I have enjoyed using his lab manual for the past many years. I'll miss seeing him in the halls of our building.

• Moe was special to me. When I started teaching at BU, Electronics was the first undergrad course and I taught it along with Moe. He was an exemplary man. A very, very kind person. I will miss him.

• Moe was always an inspiration to me. He was always so strong and positive in mind and spirit, despite the physical impairments of his later years. We never had an unkind word between us over many, many years, and I cared deeply for him and respected him in every way.

I am sure I can speak for all of us here in expressing our admiration and respect for Moe and our sadness at his passing. May his memory be a blessing.

PASSINGS

Alden T. Greenwood (ENG'53) Mason, New Hampshire

Richard J. Osborne (ENG'61, '63) Venice, Florida

David H. Leonard (ENG'62) Vernon Rockville, Connecticut

William F. Cullinane (ENG'67) West Hartford, Connecticut

Domenic A. Coppolino (ENG'72) Wakefield, Rhode Island

John S. Coyner (ENG'86) Hinckley, Ohio

Engineering Leadership Advisory Board

Dean Kenneth R. Lutchen has convened a group of senior executives from industry and academia to advise him on future directions, challenges and opportunities for the College. This Engineering Leadership Advisory Board will offer input on how the College of Engineering can impact future technologies, recruit outstanding faculty, solve complex problems, set priorities, and garner the additional resources necessary to bring the College to the next level of excellence.

Dean Lutchen and the College are grateful for the advice and service of the Engineering Leadership Advisory Board members:

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"You could say I'm a hard-core experimentalist," says AME Assistant Professor Kamil Ekinci. "My experiments verify existing theories, and sometimes, lead the way for new theoretical work."

It's the right time to be at Boston University, says Ekinci, whose research focuses on nanodevices and scanning probe microscopy, a very high resolution microscopy technique. "Boston University is on an upward slope. The College of Engineering made a commitment to invest in my research, and it's great to team up with people of different backgrounds. The interdisciplinary nature of the University is tremendous.

"The students that I work with are major stars, some of whom have been published in top scientific journals such as *Nature* and *Physical Review Letters*. It's not easy to find students like this."

Kamil Ekinci

Ph.D., Brown University
Assistant Professor of Aerospace and Mechanical Engineering

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