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FALL 2008
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BU College of Engineering MAGAZINE

FALL 2008

Editor
Michael Seele

Staff Writers
Kate Fink, Jason L. London

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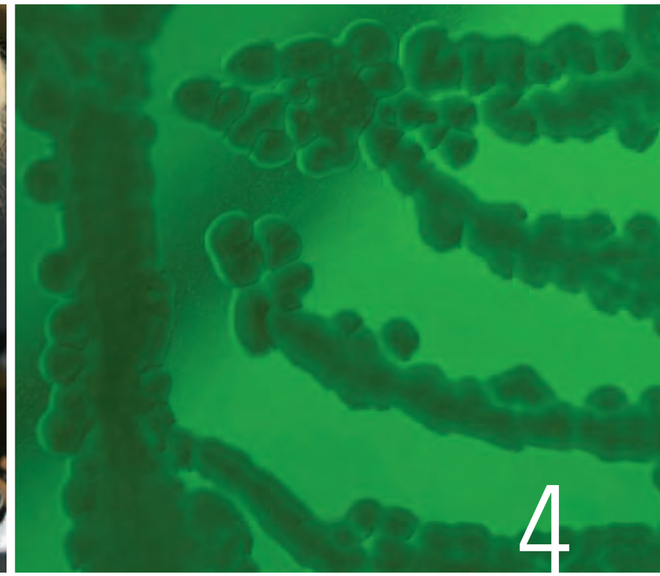

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COVER: The E. coli *cultures pictured here produce extra fatty acids with long carbon chains that can be used to create alternative fuels. Biomedical engineering graduate student Sheetal Modi plated the cultures grown for this photograph.*

Retooling

By Dean Kenneth R. Lutchen

If engineering is about anything, it's about change driven by a need to enhance. We engineers are always looking to create new things, or make existing things better. At the College of Engineering, we've been at that for more than a half century now, and the changes have been striking. What started as a small school for aeronautical engineering and aircraft maintenance has evolved into a major research college that boasts a range of undergraduate and graduate degree programs and innovative faculty who conduct world-renowned research addressing many cutting-edge challenges in our society. What had remained the same for more than three decades, however, was the structure of the College itself, a configuration of four academic departments created in 1969 that hadn't changed substantially since the mid-1970s.

Shortly after I became dean in 2006, I asked several leading members of our faculty to convene task forces charged with examining each of the College's major areas to assess strengths and recommend ways in which we could leverage them to attain greater impact. These committees delved into the work and came back with excellent reports pointing to strengths in advanced materials, biomedical technology, networks and systems, micro- and nano-technology, and sensors and imaging. Faculty research and course developments in these areas were advancing applications in health, energy, defense and information systems. What is striking about all of these areas is their interdisciplinary nature. None could be pigeonholed exclusively into—or were being advanced exclusively by—any single existing department.

Indeed, at Boston University, engineering faculty from different departments have been collaborating for years; oftentimes colleagues from other schools and colleges at BU also have been involved. This spirit of cooperation evolved on its own over many years and has distinguished us from other engineering schools. While the importance of interdisciplinary research is self-evident at the graduate level, less obvious is the substantial impact it has, and needs to have, on undergraduate education. Faculty researchers publish their discoveries in journals for the world to see, but they also bring them directly into the undergraduate classroom, providing their students with the latest knowledge. In many cases, faculty members eagerly take undergraduates into their research labs—a place traditionally reserved for graduate students—and involve them directly in the innovation process.

As anyone with even a cursory knowledge of the field knows, engineering has become a highly interdisciplinary profession and that is not going to change in the coming decades. Engineers of every stripe will be working with colleagues from other disciplines within and outside of engineering and science to create the innovations of today and tomorrow. Then, they will need to work with people in the business world to bring those innovations into use. As engineering educators, we must prepare our students for this reality.

We certainly have been doing that through initiatives like our study abroad programs that give our students insights into other cultures and people, and through a partnership with the School of Management that shows our students the ins and outs of commercializing technological innovations. Outside-the-classroom opportunities like Engineers Without Borders enable students to see firsthand what a difference engineering can make in people's lives.

Putting all of these pieces together, it became evident that our students would be better served by a structure that formalized and encouraged cross-cutting education and discovery. The results—an expanded Mechanical Engineering Department and two new interdisciplinary divisions devoted to research and graduate education in Systems Engineering and Materials Science & Engineering—are detailed in the story on page 3. Our College is now structured to—on one hand—ensure that students receive an education with solid engineering foundation in established disciplines, while—on the other hand—provide the flexibility and opportunity for all students to formally engage in cutting-edge, interdisciplinary and integrated fields such as aerospace engineering, manufacturing engineering, systems engineering, materials science and engineering, and nanotechnology and engineering, just to name a few.

This new organization allows the College to meet the needs of today and the foreseeable future, and to be more flexible in our ability to seize appropriate opportunities that arise in the coming years and decades. It also helps the College ensure that our graduates will continue to be leaders in an ever-advancing world. I am immensely proud of our faculty for embracing this unique vision and for working so hard to insure its implementation. It will enhance the quality of the educational experience for all students and the passion for education in all faculty.

By Michael Seele

Re-engineered for the 21st Century

College enhances structure to meet challenges of today and tomorrow

To ensure that the College of Engineering provides its students with the foundational principles and practices of the profession's core disciplines while simultaneously gaining agility in rapidly emerging fields, Dean Kenneth R. Lutchen has announced the College's first major organizational change in more than 35 years. Effective July 1, 2008, the College expanded its Mechanical Engineering program, while adding two divisions that will offer a suite of new degree programs.

The new structure allows the College to capitalize more fully on the signature spirit of collaboration among its faculty. The overarching aim is to facilitate greater interdisciplinary research and educational efforts that can impact society, while informing the undergraduate curriculum on emerging technologies and engineering fields.

The new structure is the result of a two-year process that began when Lutchen convened several faculty committees to examine the College's current state and future aspirations.

"It became clear early on in the process that our faculty is highly accomplished in research and education, and poised to make another upward leap," Lutchen said. "But the College's organizational structure, largely a product of the 1950s and '60s, needed to be changed to better facilitate advancement. There was general agreement that we required a new structure that is grounded in tradition yet flexible enough to position students to meet the challenges of engineering's future."

Lutchen noted the critical role of faculty in shaping the College's future.

"The programs any engineering school offers its students must take advantage of the research expertise of the school's faculty," he said. "What separates us from many of our competitor schools is the easy collaboration our faculty enjoys across disciplines. Over the years, this has led our faculty to pursue new research that is not necessarily tied to our historic organizational structure."

For example, the discipline of manufacturing engineering throughout the nation has undergone many changes since BU established its department nearly 40 years ago. Over time, faculty research has shifted to areas like materials science and engineering, and to the rapidly emerging discipline of systems engineering, which studies complex systems of many types, including micro- and nano-systems, manufacturing systems and others.

"As a major research school, we should not be sustaining degree programs, especially larger undergraduate degree programs, in subjects where we do not have a critical mass of research-active faculty with expertise in the field," Lutchen said. "Obviously, faculty research drives graduate programs, but it also has an impact on the undergraduate curriculum, giving students direct access to the latest developments in the field."

Accordingly, the College is combining the mechanical, aerospace and manufacturing engineering programs into a new Mechanical Engineering Department. The Biomedical Engineering, and Electrical & Computer Engineering departments remain unchanged.

The Mechanical Engineering Department will offer three versions of an accredited bachelor's degree beginning in the fall of 2009. One will be a traditional mechanical engineering degree; the others will be mechanical engineering degrees with concentrations in either aerospace engineering or manufacturing engineering. The latter two require students to select their professional and technical electives, and senior design projects, in accordance with the theme of their chosen concentration. The concentrations allow students to position themselves for careers in aerospace or manufacturing engineering, while providing a foundational bachelor's degree in the well-known discipline of mechanical engineering. The concentrations will be formally noted on student diplomas and transcripts.

At the graduate level, the Mechanical Engineering Department now offers master of science and doctoral programs in mechanical engineering, as well as master of science programs in manufacturing engineering and global manufacturing, the latter operated in conjunction with the Fraunhofer Center for Manufacturing Innovation.

Students already enrolled in the older versions of the aerospace and manufacturing engineering programs will be able to complete their degrees.

Along with research in the three academic departments, two new divisions have been created to facilitate interdisciplinary research in areas that draw faculty from all engineering departments—as well as from physics and chemistry from the College of Arts & Sciences—and the School of Dental Medicine.

The Division of Materials Science & Engineering will encompass research in such diverse areas as biomaterials, electronic and

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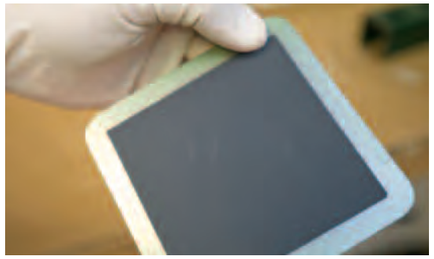


(From top) A solid oxide fuel cell; graduate students Alex Fichtenholtz (left) and Sheetal Modi engineer bacteria to generate alternative fuels; Modi's fatty acid-producing *E. coli* incubate in a Petri dish; Professor Ted Moustakas oversees production of LEDs in his laboratory.
(Opposite): Graduate student Soobhankar Pati assembles his garbage-to-fuel device.

By Kate Fink

What's Next?

As the world confronts an oil crisis, researchers are developing clean energy alternatives

One British Thermal Unit (BTU) heats a pound of water by one degree Fahrenheit. A gallon of gasoline contains 124,000 of them; a barrel of crude oil, 5,800,000. According to a Department of Energy report, the United States used 101.605 quadrillion BTUs of energy last year, the biggest chunk of which—40 percent—was from petroleum. Renewable energy provided the smallest amount at 7 percent. These proportions, however, are beginning to shift.

With monetary and environmental incentives aligning, the renewable energy slice of the pie is poised to grow in coming years. No single invention or energy source can completely usurp the role of oil, but many can help.

"There was a point in our fuel economy where economics and environmental consciousness were going in opposite directions, but we have now come to a point where they are both headed in the same direction," said Professor Srikanth Gopalan. "Anything that you do to reduce carbon dioxide emissions and improve your efficiencies of power generation is also going to improve your economics of doing business."

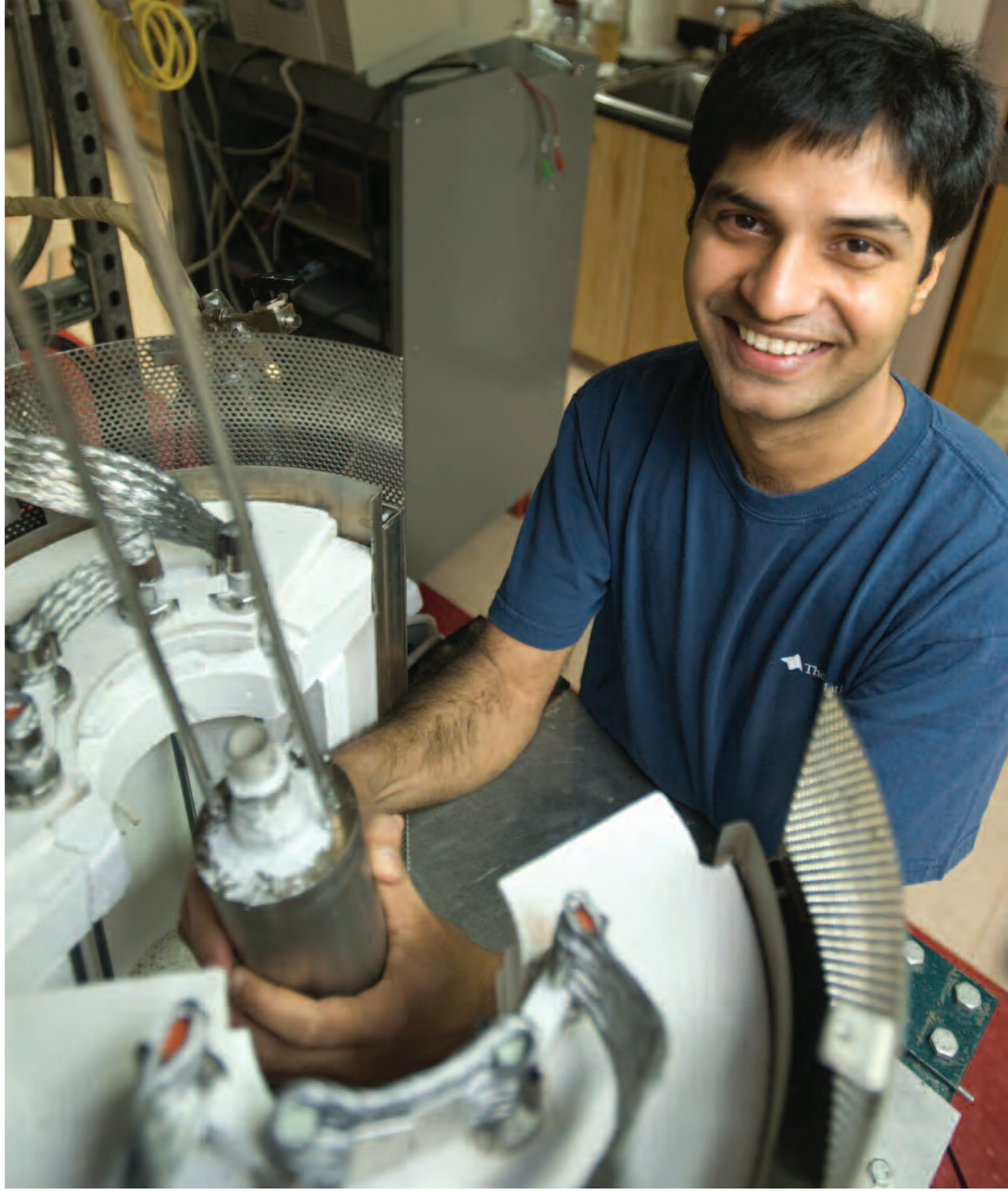
Researchers across the country are concocting a mix of many alternative energy flavors, perfecting and preparing them for the discerning palate of the American consumer. Some of the winning recipes may come from the inhabitants of BU's engineering laboratories, who are bringing fresh perspectives to renewable energy solutions. They see bacteria as oil wells, garbage as fuel and wind power moving cars.

Fuel Cells Go Back to the Future

Professors Srikanth Gopalan and Uday Pal (ME) have long collaborated on fuel cell research and are now expanding their fuel cell concepts to other technologies. They've found the methods they use to extract energy from fuel cells—using solid oxide membranes to control the flow of ions and electrons—can also turn garbage into fuel.

Graduate student Soobhankar Pati works on the garbage-to-gas technology in Gopalan and Pal's laboratory. With three business student colleagues, he entered the technology into a clean energy business plan competition last year. When presenting the concept to judges, they introduced the idea by drawing a comparison to the *Back to the Future* movie scene in which Doc runs his time-traveling Delorian on banana peels.

Any hydrocarbon-containing garbage—from food scraps to lawn clippings—can be thrown in on one side of this solid oxide membrane and bathed in liquid metal that helps dissolve the trash. Steam enters



Professors Srikanth Gopalan (left) and Uday Pal hold the starting ingredients—water and wood chips—that feed into the garbage-to-fuel prototype.

"We are now at a time where we have serious challenges to our energy supply but there are also significant opportunities."

Professor Michael Caramanis, at BU's wind turbine on the School of Education rooftop, designs software to manage the supply and demand of wind-generated electricity.

from the other side. The unique membrane allows only oxygen ions from the steam to pass through, leaving pure hydrogen behind, and syngas, a multipurpose fuel made of a combination of carbon monoxide, water and hydrogen, on the garbage side.

"Our process provides a unique solution to both garbage disposal and the production of hydrogen," said Pati.

"The average energy value in the solid waste we generate is 6.4 megajoules per pound and in the U.S., we generate 10 pounds of trash per person per day," said Pal. "The energy value in the solid waste produced by two people can meet the energy needs of an average-sized home that typically consumes an average power of one kilowatt."

After working the kinks out of a prototype, Pati plans to assemble several of these membranes into a working system producing 13 to 14 kilograms of hydrogen per day which could then feed into fuel cells that could provide enough power to keep the cycle running. With enough extra electricity generated, a house or vehicle might be powered, creating a self-sufficient, off-the-grid energy source.

Pal and Gopalan also continue to forge ahead with their research on the commercialization of solid oxide fuel cells for use in homes, businesses and vehicles. Their next step, however, requires them to return to the basic, elemental science of these devices. What happens at the atomic scale could make an enormous difference in the development of efficient fuel cells.

"We were doing a lot of application-related work," said Gopalan, "and now we have learned enough; we have made these devices work. To go to the next step, it comes down to the science again. How do charge and mass move through materials? How are mass and charge transported? That's really the secret to developing devices in this area."

A solid oxide fuel cell layers a cathode, electrolyte and anode together in a one-millimeter-thick sandwich. Fuel feeds into the anode side, oxygen to the cathode side. Oxygen reacts at the cathode to form oxygen ions, which then pass through the electrolyte and react on the anode with hydrogen, forming water as a byproduct and releasing electrons as electrical energy that can be used in an external circuit to power devices.

A solid oxide fuel cell can run on a variety of fuels including hydrogen, ethanol and gasoline. Though the cells still use fossil fuels, they burn them very efficiently, resulting in lower carbon dioxide emissions per unit of electrical power generated. A stack of cells about the size of an oil furnace could provide five kilowatts of peak power, enough for an average household.

Gopalan and Pal recently joined forces with fellow materials engineer Professor Soumendra Basu and several physics professors to improve efficiency even more. Their new multidisciplinary collaboration will examine the cathode and the cathode-electrolyte interface of fuel cells, where they see the most room for improvement and the quickest route to commercial use.

"It's the cathode reaction, the oxygen reduction reaction, that is really rate-controlling the performance of the cell," said Gopalan.

The team is well positioned to make an impact in this field. "Massachusetts has the highest density of active hydrogen and fuel cell organizations of any state in the country, with more than 80," said Pal. "Research in fuel cells and the many other energy-related technologies being investigated in the College of Engineering can steer us to a more secure and sustainable future and allow us to take advantage of the tremendous growth opportunities this industry presents."

"We are now in a time where we have serious challenges to our energy supply but there are also significant opportunities," said Gopalan. "We are happy to be right at the center, in the eye of the storm, so to speak."

Managing the Wind

"There are certain facts about wind," says Professor Michael Caramanis (ME). "The first important one is that wind energy can generate electricity at a competitive cost, but a catch looms: it is intermittent and unpredictable, and it does not necessarily coincide with the time that electricity is needed to meet demand."

According to DOE statistics, wind power comprised just 5 percent of the 7 percent sliver of the nation's energy use coming from renewable sources in 2007.

Caramanis thinks wind's shortcomings—the unpredictability, the distance from the source to locations of high demand, and the difficulty of matching production with demand—can be overcome by developing a new type of flexible electricity management system. Central to Caramanis' plan is the coupling of wind energy with battery-powered hybrid electric vehicles. These vehicles, which rely on stored energy in batteries rather than burning through oil-based fuels, present the ideal counterpart to wind energy, he said.

"The idea in this research is how to match these two, and recognize the fact that the advantages of one can remove the disadvantages of the other," he says. "Creating a

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By Kate Fink

Students Apply Lessons to Reducing BU's Energy Use

"Whenever I describe this course to people, their eyes get really wide and they go, 'Wow, I really want to get involved with that. That sounds really cool,'" said Bill Blystone ('08).

That class, "Energy Use, Conservation and Supply Alternatives: Boston University Case Study," is taught by Associate Professor Michael Gevelber (ME), who created the course for the Spring 2008 semester when he noticed students' burgeoning interest in energy at well-attended Energy Club events. Seventeen students—graduate and undergraduate, from the College of Engineering, the Center for Energy & Environmental Analysis, and the College of Arts & Sciences—signed on for the collaborative venture to analyze ways to trim energy use at BU.

"This is a project course, not a lecture. The students were co-investigators," said Gevelber. "Realizing that they could be on the front line, bring information to the table, and create the analysis was a profound experience and that's what made it so fun and so exciting."

Associate Professor Michael Gevelber talks to student Liz Lacy.

"I took this class because it focused specifically on what we can do to make a positive impact right now," said Systems Engineering graduate student Tommy Vitolo.

To begin the course, Gevelber brought in BU administrators who, supportive of the class goals, helped select a mix of dormitory, laboratory and classroom-based buildings on the Charles River campus for students to analyze.

"Just being able to work with all these people—CAS students, other liberal arts students—with different perspectives was very, very interesting," said Blystone, who worked on reprogramming computers to go into energy-conserving standby mode when not in use.

Interdisciplinary groups also analyzed the impact of reducing the air flow into fume hoods—all 385 of them—strategically removing light bulbs and reprogramming HVAC systems. One of their most surprising findings was that a fume hood left open uses as much energy annually as a house.

In addition to the engineering itself, students realized that economics, people and policies all play a role in making energy-saving changes. Students working with fume hoods, for example, had to find ways to conserve energy while still assuring the safety of lab users. The class consulted with building managers, facilities and energy administrators, IT staff, outside experts and University officials to get their projects done within one semester.

The group studying HVAC systems noticed that they could save energy by reprogramming the system's nighttime routine to reduce the amount of air circulating, and by not heating or cooling it quite so much. The students presented their recommendation to administrators, and the Facilities Department plans to go ahead with testing the idea that could save 15 St. Mary's Street up to 11 percent of its oil bill and 7 percent of its electric bill.

"This is a great example of where we can make a change that no one notices that has a significant impact on greenhouse gas emissions and dollars," said Vitolo.

The class completed preliminary analyses that weighed benefits and savings as well as costs and investments needed to make energy-use changes in specific buildings, and extrapolated their findings to the entire Charles River campus.

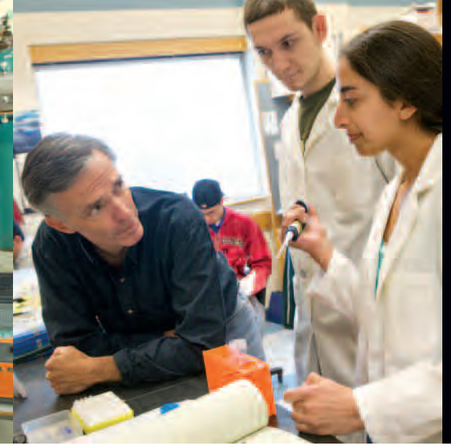
The semester ended but the work continues. The Facilities Department hired two class members, mechanical engineering graduate student Elijah Ercolino and Liz Lacy (CAS'09) for the summer. Ercolino focused on HVAC optimization and Lacy on awareness campaigns to remind people to shut off computers or close fume hoods.

"They are really inquisitive and open to new ideas. The level of interest and enthusiasm from the students was really infectious," said Aandy Ly, BU's assistant director of Energy Administration and Operations. "From what I've seen, their analysis is really logical and they have the data to back that up."

Gevelber, who hopes to continue the class in the future, said, "As a professor, what you really want to have happen is you ask a question and it spurs people on to do things. That's what happened in this course."

Professor Michael Caramanis works to match wind supply with energy demand.

Professor Ted Moustakas searches for the elusive white LED.



Professor Jim Collins confers with Alex Fichtenholtz (middle) and Sheetal Modi (right) on their bacterial engineering research.

"Biological organisms could become the most powerful tool for generating energy that we've ever had."

communications cyber infrastructure will enable the creation of markets operating in real time that match wind generation supply with electric vehicle demand."

Wind is intermittent, but batteries can sit plugged in, storing up energy during times of surplus wind generation. Wind energy may originate far away, but existing infrastructure can help manage the energy loads to flexibly distribute electricity when and where it needs to go.

Caramanis, a systems engineer, focuses his research on this cyber infrastructure—the layers of control that energy must travel through to get from a wind turbine in the countryside into the battery of a hybrid electric vehicle in a city garage.

An uncontrolled demand for electricity to charge batteries might overtax existing electricity distribution lines. A new well-controlled system could detect and fill the need for battery charging while also monitoring constraints and capacity limits of the system, Caramanis says.

"For example, at night there is often surplus energy available to charge electric vehicles. An appropriately designed cyber infrastructure could find holes in demand and excess supply in wind and match these up," says Caramanis.

Some such real-time energy markets already function in the United States, particularly for matching supply and demand in high-voltage markets and increasingly in smaller consumer markets.

"Participation of electricity consumers in these pioneering markets is already resulting in cost reduction and productivity growth," Caramanis says.

He collaborates with colleagues at BU's Center for Information Systems Engineering (CISE) who are experts in wireless sensor networks. The team uses applied mathematics and advanced economic theory to develop the hardware and software needed to manage the flow of data, money and electricity in this dynamic network. The system will analyze and act on many pieces of information, including where and how many hybrid cars are plugged in, how much wind energy is entering the system, and how the price of energy varies over time and space depending on the supply and demand. Each of these variables must be carefully optimized and controlled.

Powering a million vehicles would require about 2,000 megawatts of capacity from 400 large wind generators, says Caramanis. This would also reduce carbon dioxide emissions by about four million tons.

With existing wind turbine technology and ever-improving battery technology, this real-time wind energy network might evolve and catch on within five or 10 years, Caramanis says.

Chasing the White Light

The top third of a stoplight beams a bright-red glow onto the wall of Professor Theodore Moustakas' office. The intense light comes from 12 pea-sized, light-emitting diodes (LEDs), tiny but brilliant lights that have begun to rival fluorescent bulbs in efficiency and are already used in outdoor signs, stop lights, exit markers, car and radio displays, and flashlights. They continue to gain broader use as their efficiency increases and cost decreases. They also last "forever," says Moustakas (ECE), and require no maintenance.

The development that would truly catapult these little lights into the spotlight—and probably into spotlights—would be a high-quality white LED. Moustakas and many others in the field are focused on this goal.

Made of semiconductor materials, LEDs produce light from electrons that release photons of light in their freefall from higher to lower energy states; different semiconductor materials yield different colors of light corresponding to different amounts of energy released from electrons in that material. Red LEDs made from gallium arsenide came along in the 1970s, then blue gallium nitride LEDs—to which Moustakas made significant contributions—made their debut in the early 1990s. Green, however, presents a problem.

Researchers care so much about green because they need it to make white. The best way to make a white LED, says Moustakas, would be combining red, blue and green LEDs. Semiconductors that emit red or blue light simply fade away when researchers try to make an alloy that would produce green light.

Stoplights already use weak green LEDs, and work well enough, says Moustakas, because our eyes pick up the green light very well. They are not good enough to make a high-quality white LED, though. Although white LEDs of a sort exist now, they are really blue LEDs covered with yellow phosphor.

"If you go to RadioShack and buy a light with today's white LED, and during the night you shine it on flowers in your garden, they will look different; it will not accurately reproduce the colors, so we say the color rendering index on this is very low. You cannot use this light to read—you will tire," says Moustakas.

A true white LED would have near ubiquitous applicability—it could take the place of fluorescent and incandescent lights in houses and businesses and on outdoor displays and giant TV screens. White LEDs, widely used, could yield savings of as much as $20 billion in energy costs in the U.S. and decrease carbon dioxide emissions by 150 million tons per year, Moustakas said.

Moustakas and his research team have made meaningful advances toward the advent of the white LED including discoveries in fabrication of phosphorless white LEDs; making diodes that produce variable colors; and developing concepts to increase the efficiency of LEDs (including green ones).

The Power of Bacteria

The hallmark combination of systems and synthetic biology research has proven a potent one for the laboratory of Professor James Collins (BME). Systems biology produces sprawling maps of complex, interwoven gene interactions. The lab's researchers pore over these maps until they locate particular genes of interest, then use synthetic biology tools to tinker with the genes' specific functions.

Three members of this lab have turned their attention and their powerful toolkit of laboratory techniques to the ways that bacteria may fulfill several of our energy needs.

"Ultimately, it's a question of how will biological organisms fit into the world's energy needs," said Alex Fichtenholtz, a graduate student in the Collins lab. "It's a really tough question to answer, but I think they will fit in because they have advantages. Organisms are very, very flexible. Depending on how the research goes, they could become the most powerful tool for generating energy that we've ever had."

Though the three graduate students—Fichtenholtz, Kevin Litcofsky and Sheetal Modi—share this outlook, each sees something very different when looking at *E. coli.*

Fichtenholtz looks at the bacteria as miniscule offshore rigs, islands of *E. coli* in a Petri dish potentially spouting out fuel—not the old standard oil, but hydrogen.

Litcofsky aims to create bacterial alchemists that transform cheap, simple sugars into expensive, complex plastics that have long been made from petroleum.

Modi oversees a fatty acid farm when she plates colonies of *E. coli,* cell after cell growing long chains of hydrocarbons for her to harvest and then feed into gasoline or biodiesel production.

Fichtenholtz plans to encourage *E. coli* to make hydrogen by tweaking the bacterial transcriptional network to control which genes are activated under specific conditions. *E. coli* thrive in oxygen-rich environments but merely survive in oxygen-free surroundings. Unfortunately, they naturally produce hydrogen only under the slow-growing, oxygen-free conditions. Fichtenholtz wants to combine the best of both these states, making a version of the bacteria that makes hydrogen with no oxygen around, but does so quickly and efficiently.

He uses 60 computers to sort out whether switching on one gene might have an enormous, snowballing range of effects on *E. coli's* functions, or if it will yield only an imperceptible blip. Researchers in the past did not have such massive computational brawn available, so although they have long known that bacteria can produce hydrogen, they could not examine the bacterial genome's control system as thoroughly. Modeling the entire network of the *E. coli* genome, a goal to which he is ramping up, will take several weeks.

Fichtenholtz hopes this computational approach will give him the information he needs to sit at the center of this giant web of connecting causes and effects, pulling the strings that will increase hydrogen production and leaving others alone.

"With enough foresight and computational power, you can simulate these things—and you can predict, 'If I make these changes in the central regulatory network, will they give me what I need far down the line?'" he explains. "We're trying to redesign it so that it is a different style of organism."

Litcofsky wants to take *E. coli* even further from its normal state.

"E. coli doesn't naturally make plastic, but a lot of other bacteria do," he says. This is enough for a synthetic biologist to see the potential for bacteria to turn cheap sugars into expensive plastics. Many plastics available today originate from petroleum, so finding an alternate source could reduce the demand for oil.

Bacterial-manufactured plastics might become useful in a variety of roles, from packaging to grocery bags, and particularly tissue engineering—scaffoldings for bones or soft tissues or biodegradable sutures or sealants—because of their biocompatability.

Researchers, including Litcofsky, can make plastic with *E. coli* fairly easily by plugging in three genes borrowed from the plastic-producing bacteria *Cupriavidus necator.* The bacteria eat up the sugar and convert it to plastic for storage.

Litcofsky's challenge, unlike that of Fichtenholtz, is not the quantity of production—some bacteria can crank out plastic until it comprises 80 to 90 percent of their weight—but the quality of the product.

"The determinants are which carbon sources you feed it and which synthetic genes you have," he says.

He can change the properties of the plastic by feeding different sugars to the bacteria, but only within a limited range. For example, an extra carbon in the sugar gives the resultant plastic a less brittle consistency. The next step, he says, is expanding this range of possible plastic products.

"You can take genes from different bacteria and swap them in. Can we put in the necessary synthesis pathway to go from the simple carbon source to the more complicated polymer?" asks Litcofsky.

By patching together a longer sequence of plastic-manufacturing genes, Litcofsky hopes to engineer bacteria to cheaply produce high-quality plastics and even tailor-made plastics for specialized uses.

Just as carbon atoms arranged as a sugar can be reconfigured into plastic, the long carbon chains of fatty acids might be converted into fuels.

Modi's goal is to harvest bumper crops of fatty acids from *E. coli*. The long carbon chains of fatty acids, with a few modifications to the molecular baubles hanging off the end of the chain, could then be used to manufacture gasoline or biodiesel.

Like Fichtenholtz and Litcofsky, Modi aims to do this by understanding and then manipulating the regulation of genes within the bacterial cell.

"Eventually, I hope to be able to switch on certain pathways or genetic modifications that are more amenable to my needs, and then switch off things that are shuttling energy or metabolites away from my processes," she says.

To achieve this super-efficient state, Modi will use genetic toggle switches developed in the Collins lab. Once a bacterial colony grows to a high enough population, she can flip these genetic switches, turning off one set of genes and turning on another, to go from a growth state to a fatty acid production state.

She points out that other researchers have started companies based on using microbial hosts as miniature manufacturing plants. A recent well-known success story is that of Berkeley researcher Jay Keasling's *E. coli* that produce an anti-malaria drug.

"That just shows you it is a possibility; it's not just a dream," said Modi.

From all the possibilities in labs across the country and the world, ideas dreamed up and turned into reality in College of Engineering laboratories may become integral pieces of the patchwork of renewable energy solutions that will someday blanket the country.

"Right now we're seeing some fascinating science being conducted at universities and companies," said Collins, "But it remains to be seen who will be the first to implement bioengineered processes that are sufficiently large-scale and efficient enough to make a difference in our national energy needs. That's the challenge—a big challenge."

Re-engineered for the 21st Century, *continued from page 3*

photonic materials, materials for energy and the environment, and nanomaterials. The College announced earlier this year that it will offer new master of science and doctoral degree programs in materials science and engineering. The division will also benefit from relationships with the Photonics Center and the Center for NanoScience & NanoBioTechnology.

Systems Engineering will draw on faculty researchers from all engineering departments, as well from the computer science and mathematics departments in the College of Arts & Sciences and the School of Management. They will conduct research in such areas as sensor networks, cooperative control, robotics, intelligent simulation, systems biology and manufacturing systems. The division is expected to benefit from a relationship with the established Center for Information Systems & Engineering, with which many systems faculty are affiliated. The division will be responsible for the College's long-standing doctoral degree program in systems engineering and expects to complement it with master of science and master of engineering degree programs within the next year. The MS programs will have a research-based focus and will require students to complete a thesis; the MEng degree will primarily target professionals in industry and will not require a thesis.

Separately, the Biomedical Engineering Department has added a professional master of engineering degree for individuals interested in the medical device and biotechnology industries. This one-year degree program caters to professionals already in these industries or students who want an additional year beyond their bachelor's degree to prepare for the engineering and innovation fundamentals associated with new biomedical technology products. The MEng degree is an addition to established bachelor's, master of science and doctoral degrees offered by the highly ranked BME department.

"These research-based divisions are perfectly suited to today's engineering environment," Lutchen said. "As the profession becomes increasingly multidisciplinary, agencies that support engineering research are funding cross-cutting projects that are likely to have great impacts on society. For several years, our faculty have been conducting such research, and these divisions further ease the interaction our faculty have with each other and with colleagues in BU's College of Arts & Sciences, School of Medicine and elsewhere. We are already beginning to see these efforts bear fruit in the form of numerous interdisciplinary grant proposals and funding."

The divisions also give the College the ability to adapt to changes in engineering's emphasis in the coming years and decades, Lutchen said. Moreover, the concept of undergraduate concentrations provides a vehicle to introduce similar constructs in other emerging fields. Lutchen has asked the faculty to design concentrations in energy and environmental systems and in nanotechnology that could be accessible for undergraduates from any of the existing foundational degree programs offered within the departments.

"By all indications, engineering research will advance rapidly in the coming years and having an interdisciplinary focus allows the College to keep up with these changes," Lutchen said. "By creating these divisions and this more agile department and degree structure, we are institutionalizing the interdisciplinary nature of research and education that has been our hallmark for years, and in doing so making it easier to adapt to whatever changes the engineering environment may bring."

By Kate Fink

Seeing the Value in Optics

Alums' latest start-up focuses on display technology

Amit Jain (ECE'85) sat in his lawyer's office. He and his business partner, Roger Hajjar (ECE '88), had just decided to turn their new idea into a company, which led to another important decision that also had to be made on the spot: What should they name the new venture?

"We were brainstorming and said, 'OK, spud means potato, and Sputnik was the first high-tech satellite, and we make high technology for couch potatoes,'" said Jain, CEO and co-founder of Spudnik, Inc. The name also proved useful in an unexpected way. With the company newly founded and technology still secret, Jain and Hajjar wanted to keep it quiet. "If you Google 'Spudnik' the top result is a potato equipment company, which was fine with us," said Jain.

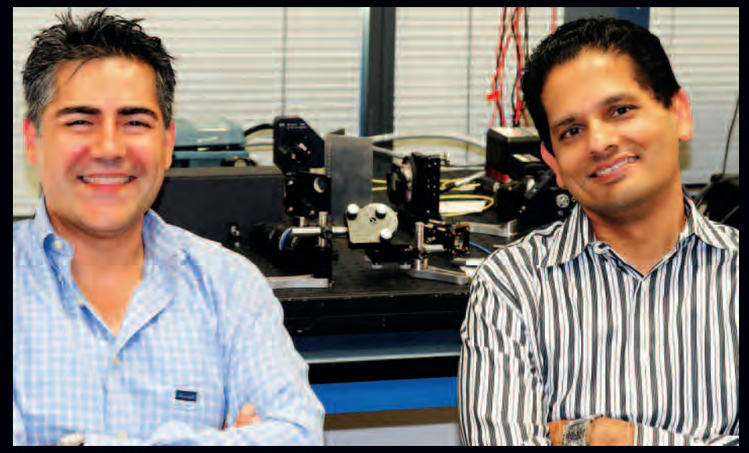
Jain and Hajjar's Spudnik has existed for about three years, but they cannot yet divulge the exact technology Spudnik is developing, or its launch date. They will say it is a display application that uses novel, laser-based scanning technology and could have a $40 billion market in displays, from televisions and computer monitors to large-scale screens and signs. The technology is also highly energy-efficient and takes little power and water to build, making its manufacture and use environmentally friendly.

Jain's path to high-tech entrepreneurialism began in India, continued on to Boston University, and then took him to California.

When Jain finished his bachelor's of science in physics, chemistry and math in India, he came to Boston University and completed his electrical engineering bachelor's degree in just two years. Before graduation, at the final Dean's List party of the year, Dean Louis Padulo asked students who had been on the dean's list every semester to raise their hands.

"I was one of them," Jain said, "and a professor—Masud Mansuripur—spotted me. He said, 'what are you doing this summer? Come to my lab, I want you to learn optics.'"

So, Jain completed his master's degree in the Optical Data Storage Lab run by Mansuripur and Professor Michael Ruane. There, he met undergraduate Roger Hajjar, who helped him build circuits. It was the first of many fruitful collaborations for the duo.



Roger Hajjar (ECE'88) (left) and Amit Jain (ECE'85).

Jain next worked for Digital Equipment for seven years, which he calls "my biggest training ground." He then worked for a start-up company and earned his MBA. "I was still thinking about optical disk technology I'd developed at Digital with my colleagues," Jain says, "but I couldn't form a new company on my own because I wasn't experienced enough at the time."

He didn't let inexperience stop a great idea, though—he found two senior executives in Silicon Valley, transferred the technology and moved to California to start a company, Terastor. He also called up his old labmate Hajjar and asked him to come out to California so the two could work together.

Including Terastor, Jain has had a hand in five high-tech companies. He and Hajjar have collaborated on three of these start-ups with technologies they've developed.

"Always, our goal is to think outside of the box," said Jain. "The number-one priority is the technology. We bring ideas from other industries to a new industry—that has been the most successful recipe for us."

"The key to our success is that we trust each other and respect each other's opinion. Having a strong, common know-how in opto-electronics allows us to quickly come up with the products on the drawing board and focus on execution," said Hajjar.

Jain usually assumes the CEO role in their companies, while Hajjar, a PhD in optical sciences, acts as chief technology officer. "Although," says Hajjar, "I tend to be more the CEO when the 'E' stands for 'entertainment.'"

Both feel they have carried valuable experiences from BU laboratories into their careers.

"The type of interaction in lab where people meet from different backgrounds and different classes, in retrospect, is invaluable," said Hajjar. "It is the best way to forge strong relationships amongst students and professors."

Jain said, "What BU gave me was lots of hands-on training in how to put systems and optics together. We had to draft our parts, design them, get them fabricated, put them together and get them to work together. This hands-on experience was the basis that all my learning has built on."

Jain tells his employees and his twelfth-grade son the same thing: "The day you say it can't be done, it won't be done. You have to be optimistic and have very high goals. Have no fear of trying new things."

By Kate Fink

Lights, Camera… Design!

An alarm clock and a nail clipper helped two engineering students get their big break in show business.

Producers of the WGBH (PBS's Boston affiliate) engineering competition TV show "Design Squad" asked each auditioning student to bring a household item to the casting call and describe its design and function. This exercise helped determine how clearly and engagingly the students could explain engineering ideas, something cast members must do frequently on the show.

Ana Pelucarte (ENG'11) brought her helicopter alarm clock—the rotors spin off the top and the alarm doesn't stop until they are replaced—and Wes Uy (MET'11 Science & Engineering) brought a nail clipper and talked about its levers.

"I was shocked—I was really excited," said Uy of making it on the show. "Just getting here…the set is amazing. There's every single tool you need. It's awesome."

"I was so happy," said Pelucarte. "I was in the middle of Newbury Street when I got the call and I was screaming. I think people were staring at me."

Uy and Pelucarte were among the six cast members selected from more than 100 applicants from Boston-area universities. The students—from Duke, MIT and Smith, in addition to BU—spent the summer together brainstorming, building and designing engineering projects, all in front of TV cameras.

Design Squad gives viewers—mostly kids and engineering enthusiasts of all ages—a realistic look at engineering and the varied types of work engineers do. The show is coupled with an extensive outreach program designed to get schoolchildren involved in engineering, to learn about the creativity and social relevance the field represents.

Each episode of the show poses a challenge from a client, and the two teams of three students compete to design the best solution. The students are shuffled from team to team on each episode, and the cast member with the most wins at the end of the season receives a $10,000 scholarship from the Intel Foundation.

Wes Uy (MET'11 Science & Engineering) and Ana Pelucarte (ENG'11) on the Woburn, Massachusetts, set of Design Squad.

A one-week "boot camp" gave the cast an intense introduction to engineering concepts and tools, including designing circuits, learning about aerospace, and using the power tools in the set's workshop. Then, they dove in for the first challenge.

With only two days to brainstorm, design and build—and with TV cameras in their faces every step of the way—it was a rocky start, said the BU students.

"I got so distracted— they were like, 'Can you say that again?' 'Can you repeat that?' But by now we're used to it. We barely realize they're there any more," said Pelucarte.

One taping day in July, the cast toiled away in their Woburn, Massachusetts, workshop, crafting remote-controlled boats with cages on top that could be used to rescue pets from a flood. The project's client, a firefighter, had noticed in the aftermath of Hurricane Katrina that people did not want to leave home without their pets, but, often, rescue boats did not have the space or the animals were too afraid to get in.

The teams had three days to build rather than the usual two, because this design challenge included a surprise trip at the end of the week. The day after finishing their pet boats, the cast and crew flew to New Orleans to test them for the client.

Pelucarte and Uy, working on separate teams for the first time after working together on the previous two challenges, each believed their team could gain the upper hand. Without giving too much away to the opposing team member, they described their own approach to the problem.

"I think we're on a pretty good track," said Pelucarte of her team's design in the middle of day two. "We've mixed some different mechanisms, we're doing some redesigning, and it's working pretty well."

Uy said of his team, "We've done lots of testing. The first day we committed to just testing a whole bunch of different theories and narrowing it down to the best. We definitely learn through these challenges never to underestimate the power of brainstorming because what we all tend to do is latch onto a single idea and not consider different ways to approach it when there could be simpler or more effective solutions."

With cameras rolling and microphones listening in, Ana Pelucarte (ENG'11) works with Green Team members on a lifeboat for pets during a Design Squad challenge.

Though the summer workdays can seem long and hot and the engineering projects challenging, the atmosphere on set stays light. The water-craft testing pool doubled as the venue for a cannonball contest once the day's work was done.

An episode's challenge might be inspired by almost anything. Executive Producer Marisa Wolsky said, "We try to emphasize that it's a creative process that touches a wide range of disciplines. We want them to see that engineering touches everyone's lives. Most kids don't have an idea of what an engineer is, and those who do have stereotypes, and we want to debunk those stereotypes."

The show, which has won Peabody and Emmy awards, first aired nationally in April 2007. Season 2, which premiered in April 2008, has aired in 88 percent of the top 50 markets across the country. The third season, with Pelucarte and Uy, will air next fall. Viewers can also watch episodes online at pbs.org/designsquad.

"The best thing about this is the experience I'm going to gain. I'm learning so much that's going to help me not only in the next years of school, but also in my job in the future," said Pelucarte, who lived in Venezuela for the first 12 years of her life, and then moved to Miami before attending BU. "I've liked BU since I was little. Even when I was living in Venezuela I knew about BU. It's been a goal for me to get here. Thanks to my freshman year in BU engineering, I feel I was able to handle the challenges in a smarter way—all of those physics and math classes seriously paid off. This hands-on experience gave me a taste of what it is to apply this knowledge on a daily basis."

Pelucarte, who loves math, settled on engineering after flirting with architecture and other math-related career paths. "My mom's an engineer, so I got to taste a little bit of that world because of her," she said. "She encouraged me in many ways."

"The show definitely makes me realize how much I love thinking things out and then building them. Nothing besides this really makes my mind fire up," said Uy. "I just hope the cameraman is catching my good side."

By Kate Fink

Collins Named BU's First HHMI Investigator

In May, The Howard Hughes Medical Institute (HHMI) named Professor **James Collins (BME)** one of its new investigators. Collins was one of 56 biomedical science researchers selected from among 1,070 applicants across the country.

Members of an elite group, HHMI investigators have creative license to pursue novel, high-risk avenues of research. The Institute awards a total of more than $600 million during the first five-year term; once established, investigators typically receive about $1 million per year.

"These 56 scientists will bring new and innovative ways of thinking about biology to the HHMI community," said Thomas R. Cech, HHMI president. "They are poised to advance scientific knowledge dramatically in the coming years, and we are committed to providing them with the freedom and flexibility to do so."

Collins, Boston University's first HHMI Investigator, said, "It certainly is a strong sign of acceptance and acknowledgement of the types of work that our lab is doing and will help as we continue our transition into molecular cell biology. I was touched at how excited and warm everybody was at HHMI. They are excited to have Boston University as part of the HHMI family and look to assist us in whatever ways they can to help us move our research projects forward."

Collins and his research team will pursue projects that will allow them to get a closer look at what happens in single cells, such as how antibiotic resistance emerges and how the cell regulates gene expression. Another area he plans to investigate is the combination effects when two or more therapeutic agents, such as drugs or RNAi, are used together.

"We can go after cutting-edge, creative work that we wouldn't otherwise be able to pursue because of the risk," Collins said.

Collins' group has recently published research on a novel genetic toggle switch and a newly discovered, destructive molecular pathway in bacteria that underlies antibiotics' mechanism of action.

Collins joined the BU faculty in 1990. He has received many research and teaching accolades throughout his career, including being recently selected by the College of Engineering Class of 2008 as their Outstanding Professor of the Year. He also won BU's Metcalf Cup and Prize for Excellence in Teaching, was named a MacArthur Fellow and received an NIH Director's Pioneer Award.

Genius on the Mound

Southpaw James Collins throws out the first pitch at Fenway Park for the Red Sox game August 29. He was selected by the Red Sox as a medical all-star.

"It was thrilling to have the opportunity to throw the first pitch," said Collins. "However, I realized that I love a crowd when you hand me a microphone, but I don't love a crowd when you hand me a baseball."

The nerves never showed though and Collins got the team started on the right foot; the hometown heroes beat the White Sox 8–0.

The Red Sox, however, have not yet announced Collins as a permanent addition to the bullpen.

By Kate Fink

Advisory Board Making an Impact

A year after its creation, the College's Engineering Leadership Advisory Board is helping Dean Kenneth R. Lutchen chart a course for the future. A collection of senior leaders and visionaries from industry and academia, the board advises Lutchen on the challenges and opportunities facing the College and the profession.

"As an educator of the next generation of engineering leaders, it is imperative that the College remain close to developments in the field and this board is helping us do that," said Lutchen. "This group has an incredible wealth of expertise and is providing valuable insights into directions in innovation, technology challenges for the future, and what employers are looking for in engineering graduates. Seeing the College through their eyes helps us stay on the forefront of engineering education and research."

The 16 volunteers on the board—including leaders in the high-tech and software industries, entrepreneurs, university administrators and consultants—bring their viewpoints to bear on issues that affect the College's future, including how to best take advantage of new technological innovations, recruiting outstanding faculty, setting priorities, and selecting and refining goals for the future. The board has already contributed to the reshaping of the College into new divisions and departments to capitalize on the interdisciplinary nature of faculty expertise.

"The challenge is to find areas the College can be great at, pick them and become a leader in those disciplines—as the College is today in biomedical engineering," said board member Richard Reidy, an executive vice president at Progress Software Corporation.

As ambassadors and supporters of the College, the board members help to represent BU as having a deep talent pool and connect the BU engineering community to other sources of expertise.

"Our motivations are all the same," said Reidy. "We need to attract more students to engineering. It is critically important; the greatest improvements to overall quality of life have always been engineering-driven, whether in medicine, communications, computing or transportation. As a country, we've always been good at that, but some of it is being lost. We're in danger of losing our competitive advantage, but beyond that, people trained in engineering, math and science are good for the whole world, not just for the U.S."

From left to right, John Tegan, Ralf Faber, Dean Kamen, John Ullo, Tom Magnanti, Ronald Garriques, John Abele, Richard Reidy, Roger Dorf, Norman Gaut, William Huyett, Noubar Afeyan, Janie Fouke, and Dean Kenneth R. Lutchen. Not pictured: Doug Adams, Jon Hirschtick, and Nick Lippis.

Members of the Engineering Leadership Advisory Board are:
John Abele, founder and founding director of Boston Scientific; Doug Adams, president and founder of SOLX; Noubar Afeyan, managing partner and CEO of Flagship Ventures; Roger Dorf, vice president and general manager of Wireless Group, Cisco Systems, which acquired Navini Networks; Ralf Faber, co-founder and president of 3Wave Optics, LLC; Janie Fouke, provost of the University of Florida; Ronald Garriques, president of Dell, Inc.'s Global Consumer Group; Norman Gaut, chairman of SWS Inc. and co-founder of PictureTel Co.; Jon Hirschtick, founder and board member of SolidWorks Corporation; William Huyett, Board of Directors of McKinsey & Co., Inc.; Dean Kamen, president & founder of DEKA Research & Development Corporation; Nick Lippis, president of Lippis Enterprises; Tom Magnanti, institute professor and former dean of engineering at MIT; Richard Reidy, executive vice president at Progress Software Corporation; John Tegan, president and CEO of Communication Technology Services; and John Ullo, senior management advisor of Schlumberger Technology Corporation.

By Jason L. London

Increased Fellowships Reflect ENG's Rising Profile

As the field of engineering becomes increasingly competitive, the need for research outlets at the doctoral level is growing rapidly. Augmented by an array of existing fellowships, new fellowship opportunities at the College of Engineering are helping to meet this demand.

A National Science Foundation Fellowship helps fund Allison Squires' research.

In consecutive academic years, Boston University and the College of Engineering have participated in creating two fellowships that prepare doctoral students for careers in science and engineering.

In conjunction with the Army Research Laboratory, in 2006 Boston University's Photonics Center began supporting graduate student researchers in the interdisciplinary field of photonics. Last year, the College and a group of Boston-based biomedical and health care institutions founded the CIMIT (Center for Integration of Medicine & Innovative Technology) Fellowship, which is awarded to students researching health care issues and contributing to the field by, for example, developing medical devices or creating algorithms and software for use in clinical practice.

"The rising number of graduate students with prestigious fellowships signifies the College's equally rising status and profile," said Selim Ünlü, associate dean of Research and Graduate Programs. "The excellence of our programs and students continue to be recognized by external funding agencies, institutions and foundations."

The Photonics and CIMIT fellowships are only some of the fellowship opportunities available at the College of Engineering. Currently, graduate students also receive fellowships from organizations like the National Science Foundation (NSF) and the American Heart Association.

"My fellowship has really enabled me to tailor my specific interests," said Allison Squires (BME). "The grant affords you so much more flexibility because you have your own funding. I've been able to specify my research to figure out exactly what I want to accomplish."

Squires is in the first year of a two-year NSF grant. Her research involves nanotechnology with biomedical applications, including DNA replication, transcription factors and protein production.

"When you enter graduate school, you can never be sure how things will work out," she said. "Within my first year, my initial research was much more instrumentation-focused than I intended—I wanted more biophysics. The fellowship gave me the opportunity to take classes in exactly what I wanted. With that experience, hopefully my research can take off."

Kristina Driscoll (ECE) is one of six students taking part in the Photonics Fellowship, which allows students in engineering, physics, chemistry and other sciences to share research. A fourth-year graduate student, Driscoll also taught biology and environmental science at Boston's English High School in 2004–2005 through an NSF grant.

"The Photonics Fellowship allowed me to become more involved with the entire Photonics Center and BU community," she said. "We've been able to interact with one other—that most likely would not have happened otherwise. It really created an interdisciplinary atmosphere."

The most recently awarded fellowship is the prestigious Clare Boothe Luce Graduate Fellowship, awarded to female science, mathematics and engineering graduate students nationally. Third-year doctoral student Michele Savery, one of two recipients of the Luce engineering fellowships at BU, is studying the effects of hyperglycemia on the microvasculature and testing the effectiveness of various therapies related to blood vessel damage in kidneys.

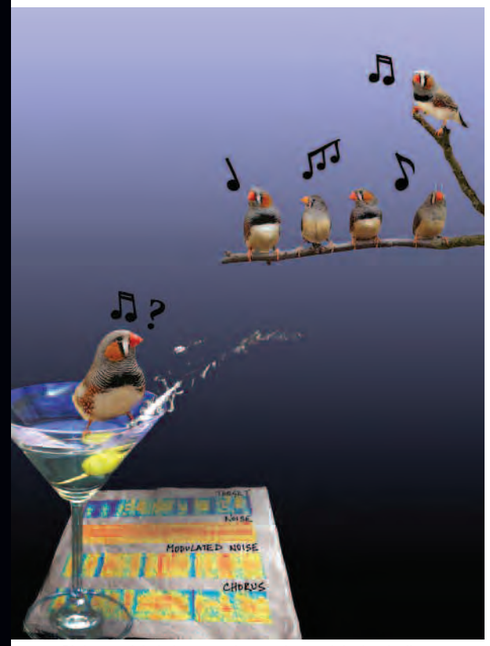
"As you get further along, the number of women in engineering decreases. It can be difficult to find a mentor," Savery said. "In addition to the funding, the fellowship offers workshops on mentoring, support and career path opportunities."

Benjamin Hansen (AME) is in the first year of his NSF fellowship. Working with Assistant Professor Kamil Ekinci, Hansen said that the College of Engineering environment and his NSF grant provide a solid foundation for his cross-disciplinary research.

"I love how the professors and departments collaborate on interdisciplinary research," he said. "That's very important to me. Being in this sort of environment really motivated me to write a solid grant proposal and gave me the flexibility to really investigate which research project fits me best."

Songbirds Help Solve Complex Neuroscience Puzzle

The twitter of birdsong and the chatter of a cocktail party both contain many layers of similar sounds, yet birds and people can often pick out, and listen to, a single voice from the cacophony. The question of how the brain does this, commonly referred to as the 'cocktail party problem,' has long been studied but is not yet solved.



Birdsong might help researchers understand the 'cocktail party problem'—how people can focus on specific sounds in noisy environments. (Graphic by Rajiv Narayan.)

Associate Professor Kamal Sen (BME), graduate student Rajiv Narayan (BME) and colleagues have recently discovered specific neural difficulties presented by the cocktail party problem. They use the complex conversations of birds—whose songs form structures similar to the words and sentences in human language—to understand how the brain can select one voice to pay attention to while relegating others to the background. Their research was published in *Nature Neuroscience*.

"Songbirds show striking analogies to human speech in the way they sing," said Sen. "They can help us understand how complex sounds are processed in the brain. This paper gives us a glimpse into what happens at the neural level that makes the cocktail party problem so hard. We are now building on these results to design new experiments to understand how the brain solves this problem."

By looking at a situation gone wrong—where the brain cannot perform its trick of picking out just one voice—the researchers hoped to learn exactly what neuronal activity helps or hinders this ability.

"Birdsongs are made of discrete units of sound, like words in a sentence," said Sen. "Cortical neurons typically fire during each 'word' in a song, echoing the song's rhythm."

But when other songs mask the target tune, the neurons mix up their signals, Sen and colleagues revealed. The normal neural firing pattern that corresponds to words decreases in strength, and abnormal neural firing during the gaps between words in the song increases.

These results begin to uncover the root of the cocktail party problem: In trying to interpret such tangled patterns of sound, neural interference can keep the brain from correctly selecting and interpreting the signals to which it should pay attention.

Sen and graduate student Narayan collaborated on this work with Virginia Best and Erol Ozmeral (in Associate Professor Barbara Shinn-Cunningham's laboratory) and Elizabeth McClaine (in Dr. Michael Dent's laboratory at State University of New York at Buffalo) to compile complementary data on humans, birds and neurons.

"Such interdisciplinary efforts are going to be critical for solving complex problems at the forefront of neuroscience. We are lucky to be part of interdisciplinary centers, such as the Hearing Research Center and the Center for Biodynamics, that foster such interactions," said Sen.

— Kate Fink

Dean's Catalyst Awards Program Aims to Build on Success

Photonic crystal nanostructures, free radical scavenger therapies and ultrasound tumor monitoring will be studied in ENG labs this year thanks to the Dean's Catalyst Award grant program. In the program's second year, five interdisciplinary teams of researchers (selected from among 13 applications) will receive a total of $160,000 to study untested ideas that they find intriguing.

Established by Dean Kenneth R. Lutchen in 2007, the awards encourage early-stage, innovative projects that may lead to new avenues of research and are intended to support novel, interdisciplinary ideas, giving researchers the opportunity to generate proof-of-concept results that can be used to secure external funding, which several of last year's inaugural DCA recipients have since won.

"Although this is only the second year of the Dean's Catalyst Awards, the success of the program points to the vital role of this type of funding," Lutchen said. "These awards provide our research community the support needed to pursue innovative, interdisciplinary work, bridging the gap between a new idea and winning the support of a major funding agency."

continued on page 18

Dean's Catalyst Awards Program Aims to Build on Success, *continued from page 17*

The 2008 award winners are:

Assistant Professor **Hatice Altug (ECE),** working with Physics Professor Shyamsunder Erramilli, will investigate a technique that uses photonic crystal nanostructures to detect proteins, even in very low concentrations, in a cell.

Associate Professor **Edward Damiano (BME)** will research a combination treatment for diabetes that may help reduce damage to blood vessel tissue common in the chronic high-blood glucose state of diabetes. Using a free radical scavenger along with the standard treatment of insulin may confer a protective effect.

Professor **Maxim Frank-Kamenetskii (BME)** plans to develop a laboratory test that can rapidly detect DNA in viruses that are closely associated with certain blood cancers. Frank-Kamenetskii will work with Associate Professor Adam Lerner (MED) on the project.

Associate Professor **Todd Murray** and Professor **Ronald Roy (AME)** will research a new imaging technique to allow doctors to see deeper into human tissues. Their approach, photoacoustic cavitation, combines nanoparticles, ultrasound pulses and laser illumination to create bubbles in a localized area of tissue.

Assistant Professor **Tyrone Porter (AME),** working with Assistant Professor Gerald Denis (MED) and physician Alda Cossi (MED), will study the use of ultrasound as a tool for inducing drug release that minimizes toxic side effects and for monitoring tumor response to treatment.

"The DCA award competition provides a great mechanism to explore new research directions and stimulates and strengthens collaborations that cross disciplinary boundaries," said Murray.

Altug added, "It is very encouraging to see that the College of Engineering supports our team and finds our proposed work impactful and promising. Receiving the DCA was crucial for us in getting the necessary preliminary results to compete for an external grant."

— Kate Fink

Grad Student Wins Prestigious Award for Acoustics Research

At the Acoustics '08 meeting last summer in Paris, France, graduate student **Zach Waters (ME)** won the award for Best Student Paper in Underwater Acoustics for his work on developing a unique SONAR to identify buried targets.

"This is particularly noteworthy in that this was the largest collection of acousticians to ever meet and there were a lot of papers in underwater acoustics presented by students from all over the world," said Waters' advisor, Professor Ron Roy.

The meeting was a joint conference of the Acoustical Society of America, the European Acoustics Association and the Société Français d'Acoustique.

"The goal of my research is to improve the Navy's ability to find objects that are buried beneath the seafloor," said Waters, who works closely with naval scientists in Panama City, Florida, and is funded by the Office of Naval Research.

To test methods for finding buried objects, Waters performs scaled laboratory experiments with BB-sized metal spheres buried in very fine sand at the bottom of a water-filled test tank. His technique, called iterative time-reversal, involves exciting a target with an acoustic signal, reversing the received echo in time, and then, using the reversed signal as the source, sending it back out from the detector. Repeating this process many times lets Waters build up a strong signal and find the optimal waveform that will make a buried target resonate.

His award-winning presentation detailed this method as well as new variations of it that may make the technique even more useful.

"One of the things I'm interested in now is, can I identify a target? Now that I see something, can I use this technique to figure out what it is?" said Waters.

Of presenting his research to approximately 75 people, including many "big names in target detection," Waters said, "Preparing is always a little nerve-wracking, but once you start giving the talk, it's a lot of fun. It was really cool to be able to present in front of my peers and experts in the field."

— Kate Fink

Zach Waters

Grad Student from MIT Wins Research Prize

Several years of research conducted in a Boston University biomedical engineering laboratory recently garnered a prestigious honor for a graduate student—from MIT.

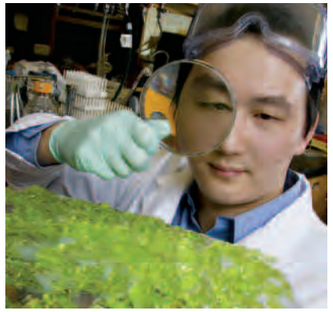
Timothy Lu invented biological tools to fight antibiotic-resistant bacteria in biofilms and human bodies. In February, the work won him the 2008 Lemelson-MIT Student Prize, an annual $30,000 award MIT presents to an outstanding MIT student inventor who is working on new solutions to real-world problems.

Lu conducted his research at BU, in the laboratory of Professor **James Collins (BME).**

"He contacted me with an interest in synthetic biology," said Collins. "He wanted to work in applied aspects of biotechnology and I encouraged him to look at this problem—it has broad medical, industrial, environmental and agricultural implications."

Lu developed a way to engineer bacteriophages—viruses that infect bacteria—with an enhanced ability to attack and destroy bacteria. By modifying the genes of one bacteriophage, he made it specifically target the mechanisms in bacteria that confer antibiotic resistance.

— Kate Fink



Timothy Lu

Seminar Visits the Intersection of Nanotechnology and Medicine

Nanotechnology becomes medicine when tiny particles can seek out cancerous tumors, or when miniature envelopes of drugs can be delivered to precise addresses within the body to release their cargo. Some such high-tech medicines are already in use and many more are the subject of nanomedicine research in laboratories across the country.

In conjunction with the Center for Nanoscience & Nanotechnology and the School of Medicine, the Emerging Technologies Seminar Series at the College of Engineering brought together nanotechnology experts from academia, industry and government to discuss "Nanotechnology in Medicine: From Diagnostics to Therapeutics," in April.

"The union of nanotechnology and medicine will likely affect our lives in ways we cannot yet understand," said Andrei Ruckenstein, associate provost and vice president for research.

Associate Professor Joyce Wong (BME) discussed her research coupling targeted nanoparticles with other diagnostic tools such as magnetic resonance imaging (MRI) to identify risky plaques in blood vessels.

"Sixty percent of women and fifty percent of men who die of cardiovascular disease had no previous symptoms," she said. "What you really want to do is initiate detection much, much earlier."

Associate Professor Mark Grinstaff (BME) aims to improve the targeted delivery of drugs using dendrimers, many-branched molecules that can hold drugs in their nooks and crannies and shield medicine from the body until the drugs reach the intended site of action, such as a cancer tumor.

BU Assistant Professor of Chemistry Bjorn Reinhard spoke about molecular rulers he makes to detect the DNA, RNA and protein interactions within cells.

— Kate Fink

Bjorn Reinhard

Nanosatellite Team Flies Toward Finish Line

In undergraduate terms, two years is half a lifetime; few classes or projects last more than a semester. But for the College of Engineering undergraduates competing in the U.S. Air Force's University Nanosatellite Program, two years is the life span of a competition that could launch their research work from the laboratory into space.

Profiled in the Spring 2008 *BU Engineering Magazine,* the nanosatellite team continues to compete with 11 other universities to design and build a working satellite that hovers over the aurora borealis and helps better predict space weather that can potentially damage spacecraft electronics and communication networks for cell phones and pagers.

The competition began in February 2007 and will conclude in early winter 2009. After reaching the midpoint of the competition last spring, the nanosatellite team is in the final phase of the competition, under the guidance of Professor Ted Fritz (CAS) and doctoral student David Voss (ENG'09). In April, representatives from the Air Force visited Boston University for a mandated Critical Design Review (CDR).

"They said it was probably one of the most impressive CDRs they had seen thus far," Voss said. "They said, 'Your design is at the point where we can provide good, critical feedback. A lot of the other schools are not even at this point.'"

Despite losing nearly half of the team to graduation, they quickly filled the open spots with new undergraduates, many of whom worked throughout the summer on the project.

In addition to laboratory work, team members attended a satellite training workshop in Boulder, Colorado, in June, successfully tested their device on a high-altitude weather balloon at Indiana's Taylor University in July, and presented their work to the Air Force at a Preliminary Design Review (PDR) at the University of Utah at Logan in August.

"We've been successful and able to get more great feedback going forward," Voss said. "We're definitely in the top two or three as far as the competition goes."

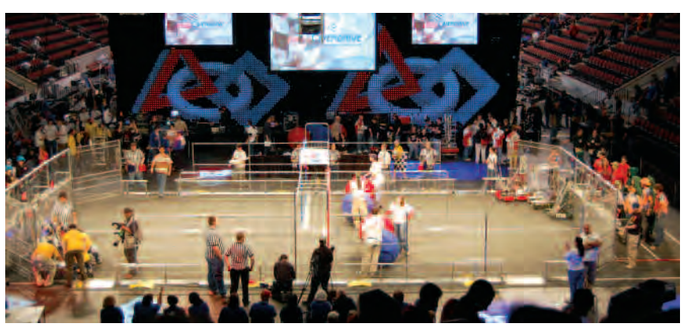
Nanosatellite team members Aaron DesRosiers and Adrial Wallick work toward finishing their satellite design and preparing for a final presentation to the U.S. Air Force.

The final obstacle is the last Air Force-mandated review in early 2009. The team is currently building a clean tent, which provides a level of protection from dirt and dust, where they will assemble the finished product and any yet-to-be-completed hardware for the final presentation.

"There's definitely a lot more work that needs to be done," Voss said. "But no team has been more successful than we have so far and we're still working."

— Jason L. London

High School Students Show Engineering Innovation



Robots prepare for battle at the FIRST competition in Agganis Arena.

Center court at Boston University's Agganis Arena is usually reserved for athletes chasing hockey pucks and basketballs or musicians belting out popular songs. But for one weekend each spring, Agganis Arena is overtaken by an entirely different species—robots.

As part of the College's K–12 Outreach Program, Boston University hosted the regional Boston FIRST (For Inspiration and Recognition of Science and Technology) Robotics Competition, in which students design and build robots to compete in a different challenge each year. Fifty-one teams from seven states participated, including one from Boston University Academy, which works out of the College of Engineering.

This year, teams scored points for maneuvering their robot to knock an opponent's ball off an overpass, crossing their robot into and out of the opponent's zone, and placing the ball back on the overpass—all in two minutes and 15 seconds. The top scorers advanced to the National FIRST Competition in Atlanta in April.

In a similar display of high school enthusiasm meeting real-world engineering, more than 100 students filled the FitRec Center in June for the 18th annual Boston University Design Competition. Working alone or in pairs, students competed for the chance to earn Boston University tuition scholarships.

Using LEGOs, plexiglass and wads of duct tape, students designed 12-inch-square vehicles to descend an eight-foot ramp, drop a bean bag through a hole at the bottom, climb back up the ramp, knock over a flag at the top and hold position against an opposing vehicle, all the while being closest to the center line at the top of the ramp. No remote controls were allowed.

"It's fascinating to see the different designs that each team has," said Brentwood High School junior Nicole Franco. "I get the same excitement from building the vehicle that I do from competing."

The Design Competition and FIRST are part of the College of Engineering's K–12 Outreach Program, which sponsors several local and national efforts to engage young people in science and engineering.

For more information, please visit www.bu.edu/eng/outreach.

— Jason L. London

Engineers Dealt a Winning Hand

"At first glance we think engineering is all about technology, but engineering is all about people," Commencement speaker Jon Hirschtick—the founder of SolidWorks software company and a former member of the MIT blackjack card-counting team popularized in books and the recent movie "21"—told the Class of 2008 on May 18.

The College Commencement ceremony recognized 425 graduates—42 doctorate, 117 master's and 266 bachelor's degree recipients.

Hirschtick passed on the advice that he said his father told him over and over. "No matter what you do in life, you must learn to deal with people. It was some of the best advice I ever received in my life," he said.

In his card-counting exploits playing blackjack at Las Vegas casinos, Hirschtick said two team members could have equal technical knowledge, but the one who was better with people could make much more money.

When he founded SolidWorks—a 3D CAD software company that engineers use to design consumer goods, electronics, medical devices and machinery—Hirschtick set it apart from other software companies by focusing on the customers. Today, SolidWorks has more users worldwide than any other 3D CAD software.

"What made SolidWorks successful was thinking about people. We put a huge emphasis in focusing on the user. We wanted to make it easier to use than anything else out there."

Hirschtick also advised graduates to use their engineering knowledge to do good.

"Engineering is all about service to humanity," he said, acknowledging that some of his early pursuits in blackjack were "frivolous," but that in the long run, "The yardstick for the results you generate as engineers will be measured in how you help humanity. Put as much attention and care into the people issues of engineering as you have in the technical."

Student speaker **Edy Tan (ECE)** commemorated the milestone by saying to his classmates, "Two thousand-eight is a special year full of change, and with change comes hope, and with hope comes endless possibilities. BU has made us engineers. The world is now ours to change."

—Kate Fink

Jon Hirschtick

Edy Tan

DoD Likes What It Hears

Barbara Shinn-Cunningham (BME) plans to help both fighter pilots and the hearing-impaired with a grant she won from a new Department of Defense program in June. She will study how the brain manages acoustic communications in high-stress situations.

Shinn-Cunningham—one of six scientists selected from among more than 500 applicants at nearly 150 institutions to receive the grant—studies how neural circuitry works in complicated situations to allow listeners who simultaneously hear many sounds to hone in on the most important one. The DoD is interested in her research because soldiers and pilots often face situations in which they are bombarded with many sources of information simultaneously and are forced to make quick decisions.

"The amount of information they're supposed to process may be too much, especially at a time of crisis," says Shinn-Cunningham. "Our work asks, can I better present the information to the listener so they get out of this inefficient mental state? Can I give them just enough, and the most important, information to ensure that they perceive it?"

Hearing-impaired people have similar problems, but in different situations. In crowded rooms, they cannot focus attention and filter out competing sounds—even with the most sophisticated hearing aids—and have difficulty tracking conversations that switch rapidly from speaker to speaker, which often makes them feel socially isolated.

Shinn-Cunningham will study the brain's responses to complex acoustic scenes using electroencephalography (EEG). She will also test how subjects function in stressful situations, such as trying to answer questions that come too fast for the subject to keep up. Using EEG, she believes it is possible that a portable, wearable device could eventually be developed that can read what the brain is doing and then interact with the wearer in an intelligent way.

—Kate Fink

Barbara Shinn-Cunningham

Franco Cerrina

University of Wisconsin's Cerrina Named ECE Chair

Dean Kenneth R. Lutchen has named **Franco Cerrina,** a professor of electrical and computer engineering at the University of Wisconsin-Madison and a leading scholar in optics, lithography and nanotechnology—particularly with applications to biotechnology—as the next chair of the Electrical & Computer Engineering Department. Cerrina assumed the position August 15 and is establishing a new laboratory in the world-renowned Photonics Center.

"I am delighted to welcome Franco Cerrina to the College of Engineering," Lutchen said. "He brings a sparkling track record as a world-class researcher and educator and an innovator whose interests align closely with the College's and University's strengths. At a highly regarded engineering program, he has been successful working across disciplinary lines to explore emerging technologies that have the potential to make huge impacts on our society. He also has a successful record as an entrepreneur and as a director of a major research center. In sum, I am confident that he will provide a refreshingly new dynamic leadership for ECE and help take the department to new levels of accomplishment."

"I am looking forward to my move to Boston University, where I hope to strongly contribute to the growth of the ECE Department," Cerrina said. "The faculty has an excellent record of successful achievements, and the opportunity for collaborations in emerging areas is definitely one of the most attractive aspects of the environment at BU. I will do my best to help the department advance in research and teaching by building on its existing strengths and by promoting new opportunities."

Cerrina, a native of Italy, has been on the faculty at Madison for 24 years and was the Lynn H. Matthias Professor of Engineering there. Since 1988, he has been the director of the Center for Nanotechnology, an internationally recognized organization for research in advanced semiconductor lithography and nanofabrication. He is also affiliated with the University's Biomedical Engineering Department, Genome Center and Materials Science Program, and with the WiCell Research Institute, which studies human embryonic stem cells.

As a researcher, Cerrina has procured and managed over $45 million in grants and research contracts. He holds 16 patents and has more than 250 reviewed publications to his credit. His research focuses on the application of physical science and engineering to manufacturing and biological problems and he is considered to be among the elite scientists and engineers in the field.

In 2000, Cerrina invented the Maskless Array Synthesizer, a device used to create nanoscale channels in glass chips that are used as tools in determining genetic activity in stem cells. He co-founded the company that commercialized the technology, NimbleGen Systems, Inc., in 1999, and served on its board of directors until it was acquired by Hoffman LaRoche in 2007. He has been president and chief technology officer of another firm he co-founded in 2002, Genetic Assemblies, Inc., now merged with Codon Devices, a Cambridge start-up.

—Michael Seele

ENG Welcomes New Faculty

Assistant Professor **Lorena Barba** has joined the Mechanical Engineering Department from the United Kingdom's University of Bristol, where she spent the last four years as a lecturer in applied mathematics. Her additional academic positions include an adjunct professorship at Chile's Universidad del Viña del Mar and a graduate research assistantship at the California Institute of Technology.

A second lieutenant in the reserve Air Force of Chile, Barba worked as a consulting engineer and entrepreneur with Chile's Consultora de Ingenìera Gear, Ltd., from 1991 to 1998. She received her doctorate and master's degree in aeronautics from the California Institute of Technology and her bachelor's degree in mechanical engineering from Chile's Universidad Tècnica Federìco Santa Marìa.

Assistant Professor **Michael Smith** has joined the Biomedical Engineering Department from the Swiss Federal Institute of Technology, where he was a postdoctoral student. He received his bachelor's degree in mechanical engineering from the University of Memphis in 1999 and his master's and doctoral degrees in biomedical engineering from the University of Virginia in 2001 and 2004, respectively.

Smith participated in the 2007 Lindau Meeting of Nobel Laureates and received the Human Frontier Science Program Organization Fellowship (2005 to 2008) and the University of Virginia's L. William Ballard Fellowship (2003 to 2004). He has contributed to 30 journal publications, book chapters, manuscripts and conference presentations.

James Galagan, an associate professor, has joined the Biomedical Engineering Department from the Broad Institute of MIT and Harvard University, where, since 2005, he worked as associate director of Microbial Genome Analysis and Annotation. He received his bachelor's degree in computer science and engineering from the University of California at Davis in 1992, his master's degree in molecular and cellular neuroscience in 1994 and his doctorate in computational neuroscience from MIT in 1999.

—Jason L. London

Lorena Barba

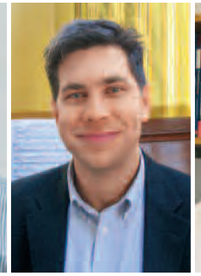
Michael Smith

James Galagan


Janusz Konrad


Amit Meller


Murat Alanyali


Joshua Semeter


Kamal Sen


Kamil Ekinci


Joe Tien

Seven Faculty Members Earn Promotions

Seven College of Engineering faculty members received promotions and tenure at the beginning of this academic year.

Professor: Janusz Konrad (ECE) Konrad has authored or contributed to over 200 publications, presentations and theses in electrical engineering, including digital video processing and stereoscopic and 3-D imaging.

Konrad was named an IEEE fellow in 2007 and received the *IEEE Signal Processing Magazine* Award in 2001. He has served as an associate technical editor of *IEEE Communications Magazine* since 1998, associate editor of *IEEE Signal Processing Letters* (2002–2004) and *IEEE Transactions on Image Processing* (1996–2000).

An associate professor since 2000, he received his bachelor's and master's of engineering degrees from Technical University of Szczecin (Poland) and his doctorate in electrical engineering from McGill University.

Tenure: Amit Meller (BME) Meller's research focuses on single molecule biophysics and nano-biotechnology.

An associate professor, Meller joined Boston University in 2006. As a fellow at the London Institute of Physics, he was awarded the Nano-Innovation Award by the Physik Instrumente in 2004.

Meller was one of nine researchers nationally to receive a 2006 NIH "$1,000 Genome" grant that aims for low-cost sequencing of individual human genomes. He also received a 2007 NSF grant to study how transcription factors recognize genomic DNA.

He earned his bachelor's degree in physics and astronomy from Tel Aviv University and his master's and doctoral degrees in physics from the Weizmann Institute of Science (Israel).

Associate Professor with Tenure: Murat Alanyali (ECE) Alanyali received the College's Legacy Gift Award in 2004 and 2005, the 2003 NSF Faculty Early Career Development Award, and 2004 and 2007 NSF grants related to research and management of network environments and wireless networks.

Alanyali earned his bachelor's degree in electrical and electronics engineering from Middle East Technical University (Turkey), his master's degree in electrical and electronics engineering from Bilkent University (Turkey), and his doctorate in electrical and computer engineering from the University of Illinois at Urbana-Champaign.

Joshua L. Semeter (ECE) Semeter's research includes ionospheric and space plasma physics, radar signal processing, and multi-spectral sensors and analysis.

Semeter joined Boston University as an assistant professor in 2004 and has served as the associate director of the Boston University Center for Space Physics since 2005.

He received his bachelor's degree in electrical engineering from the University of Massachusetts at Amherst, and his master's and doctoral degrees in electrical engineering from Boston University.

Kamal Sen (BME) Sen's research includes electrophysiology and theoretical and computational neuroscience.

In 2006, his accomplishments included a National Organization for Hearing Foundation Research (NOHR) Award, a NOHR research grant in auditory science and a NIH RO1 Grant for the National Institute of Deafness and Communications Disorders.

An assistant professor since 2002, he received his bachelor's degree in physics from Bates College and his master's and doctoral degrees in physics from Brandeis University.

Associate Professor:

Kamil Ekinci (ME) Ekinci was the principal investigator on a team that developed an inventive technique that allows researchers to collect nanoscale microscopy images roughly 100 times faster than current state-of-the-art scanning tunneling microscopes.

Ekinci, who began at Boston University in 2002, earned his bachelor's degree in electrical engineering and physics from Turkey's Bogazici University, and master's and doctoral degrees from Brown University.

In 2007, Ekinci received a U.S. National Science Foundation CAREER Award and a Boston University College of Engineering Dean's Catalyst Award.

Joe Y. Tien (BME) Tien's research centers on submicron platforms to control the microenvironment of cells.

A member of the Boston University faculty since 2002, Tien earned a bachelor's degree in physics and mathematics from the University of California at Irvine, and master's and doctoral degrees in physics from Harvard University.

During his tenure at Boston University, Tien has received the NIH/NIBIB Edward C. Nagy New Investigator Award in (2006) and the Boston University Provost's Innovation Award (2002–2003). His work has appeared in more than 30 publications.

—Jason L. London

Ruane Named Faculty Director of Outreach

College of Engineering Dean Kenneth R. Lutchen has named Professor **Michael Ruane (ECE)** as the College's inaugural faculty director of Outreach. Working with Associate Deans Selim Ünlü and Solomon Eisenberg, and Assistant Dean Rich Lally, Ruane will be responsible for developing and maintaining a formal program of faculty outreach activities and resources at the College of Engineering.

"Exciting the next generation about engineering is critical to the long-term health of the profession, and to our own College of Engineering," said Lutchen. "In Mike Ruane, we have the ideal faculty member who can spread the word about our outreach efforts and help fill the pipeline with a diverse array of talented young people who represent the future of engineering."

Ruane is charged with developing a program that will serve five main functions: assisting faculty with researching and developing proposals for establishing grants, centers, consortia and educational initiatives; working with the College's graduate committee to strategically establish and meet diversity goals for recruiting graduate students; encouraging and supporting faculty participation in outreach to K–12 schools; partnering with organizations that seek to increase science, technology, engineering and math (STEM) preparation; and developing talent and leadership in traditionally underrepresented engineering student groups.

"This position brings resources and visibility to the many outreach efforts already pursued by the College and faculty," Ruane said. "It reflects a clear commitment by Dean Lutchen to serving the community and connecting our research and teaching to the next generation of engineers."

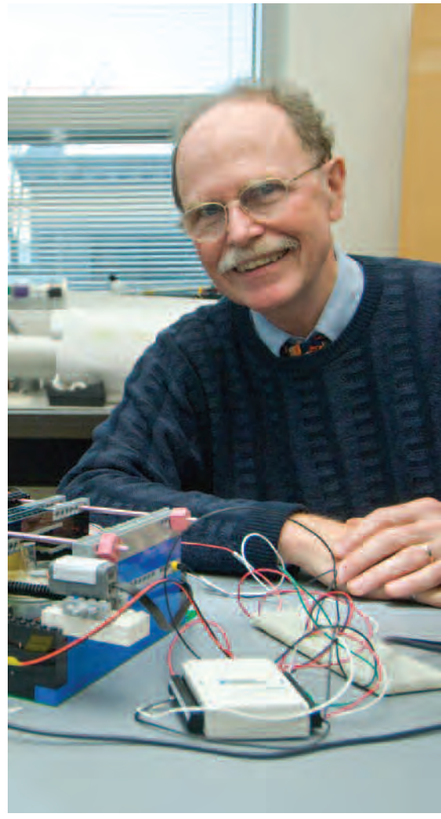
The program's initial plan calls for establishing a sound basis for outreach growth from K–12 through undergraduate programs and graduate study. Ruane hopes to create a consistent Boston University presence at national meetings of underrepresented groups that may be interested in engineering education and establish more formal ties to existing outreach efforts and groups related to engineering.

"Much of what I'll do will consist of one-on-one support for faculty interested in developing stronger outreach based on their work," Ruane said. "We'll work with faculty to identify the broader impacts of their research and assist them in conveying their research efforts, especially to the K–12 community."

While Ruane will be the first faculty member in the new position, outreach programs have long been a part of the College of Engineering. Current longstanding outreach activities include a design competition where high school students develop and build robotic vehicles, the U-Design summer program for younger students, the Science Bowl and the FIRST (For Inspiration and Recognition of Science and Technology) Competition.

A member of the College of Engineering faculty since 1988, Ruane has an accomplished background in engineering-related outreach work. He received the College's Faculty Service Award in 1991, the ECE Outstanding Teacher Award in 1999 and the American Society of Engineering Education's New England Region Outstanding Professor Award in 2004. He has worked with Boston-area schools in the National Science Foundation's graduate teaching fellowship program and with College of Engineering students through the Research Experience for Undergraduates (REU), Learning Resource Network (LERNET), Center for Subsurface Sensing and Imaging (CenSISS) and STEM programs.

"I've already been working with local K–12 communities and university colleagues active in outreach," Ruane said. "I anticipate building on those ties to make it easier for other faculty to develop outreach activities without directly worrying about the logistics of reaching teachers and younger students."


Michael Ruane

— Jason L. London

Hidden Technology Revealed in College's First Distinguished Lecture

John Baillieul

Try balancing an upside-down broom on the palm of your hand, and you'll be constantly adjusting—moving forward and back and side to side—to prevent it from falling.

"This is a prototypical unstable system," said Professor **John Baillieul (ME)** as he delivered the College of Engineering's inaugural Distinguished Lecture on March 5. In his talk, "The Evolving Applications of Control Theory to Devices, Networks and Life Itself," Baillieul explained how engineering strives to make dynamic, unstable systems—like the broom—predictable and stable.

Baillieul addressed an overflowing crowd of faculty and students on a broad spectrum of topics related to control theory, from the simple example of the inverted broom, to the use of network control systems in cars, spy planes and robots and its more recent application to complex biological systems. He also discussed some of the intriguing open questions in the field and the reputation of control theory as a "hidden technology."

Baillieul explained that the automotive industry—one of the first to apply networked control about 20 years ago—began with the question, "Could you somehow get these components to play together in a way that's more efficient than their functioning independently?"

Today, networks of sensors in automobiles control many of the vehicles' motions, the 27-kilometer-long particle accelerator at CERN uses control to lower the machine's temperature to nearly zero degrees Kelvin over a six month period, and unmanned machines use control theory to aid their traverses through skies and oceans.

One of the great questions in the field, however, remains how to best move information through networks and among multiple machines in a group. Baillieul described a photo of a single spy plane as "science," but two unmanned machines flying together remains "science fiction." There are limits on how much information can pass quickly among a group of robots.

Control theory is now expanding its reach and is used in fields such as biological research, where it can be applied to study protein folding and the interaction of many molecules within cells.

"All of cellular biology is complex reactions networked together. Genes don't characterize what's going to happen by themselves; there's some sort of network effect," said Baillieul.

The scope and applicability of control theory and engineering continue to grow, he said. "Networked systems are ubiquitous and network control systems are essential to understand in both the natural and engineered world. The future is exciting."

—Kate Fink

Acoustical Society of America Recognizes Barbone, Holt

Mechanical engineering associate professors **Glynn Holt** and **Paul Barbone** were recently named fellows of the Acoustical Society of America for their contributions to the field of acoustics.

"The ASA is the premiere acoustical society in not only America, but the world," Holt said. "To be named a fellow is one of the highest honors you could achieve in the field of acoustics."

Holt was recognized for his investigations into the dynamics of acoustically forced bubbles and drops. His current research includes biomedical and industrial applications of bubble dynamics and energetic collapses of bubbles.

Glynn Holt

Paul Barbone

Before joining the Engineering faculty in 1996, Holt worked as an alternate payload specialist astronaut with the Second United States Microgravity Laboratory Space Shuttle mission from 1994–1996. That mission's experiments included investigating fundamental fluid dynamics, crystal growth and life sciences in a reduced-gravity environment.

His work has appeared in over 30 book chapters, journal articles and technical reports. He is a member of the ASA's Physical Acoustics Technical Committee and the Biomedical and Ultrasound/Bioresponse to Vibration Technical Committee.

Barbone was recognized for his contributions in structural acoustics and acoustical imaging. His recent research work focuses on inverse problems, with primary application to acoustical imaging and detecting targets.

Barbone has been active in the field of acoustics throughout his career and has served as associate editor of the *Journal of the Acoustical Society of America* since 2004.

He received the J. William Fulbright Foundation Distinguished Scholar Award for his work in the detection and diagnosis of breast cancer in 2001 and the ASA's R. Bruce Lindsay Award in 1999 for developing novel theoretical and computational acoustics techniques.

—Jason L. London

U.K.'s Institute of Acoustics Honors Michael Howe

Professor Michael Howe (right) receives the 2007 Rayleigh Medal from Institute of Acoustics President Colin English.

The United Kingdom-based Institute of Acoustics selected Professor **Michael Howe (ME)** as the recipient of the 2007 Rayleigh Medal for his long-standing work in aeroacoustics that stretches over almost four decades.

According to the Institute, the Rayleigh Medal is the organization's premiere award and given to "persons of undoubted renown for outstanding contributions to acoustics." The medal is awarded to only one acoustician annually.

"I have been a member of the Institute since 1978," Howe said. "I have witnessed its vigorous and sustained promotion of excellence in acoustical teaching and research. I much appreciate this very great honor."

In addition to his research and academic work in aeroacoustics, Howe has contributed to over 200 acoustic-related journal articles and authored four books: *Acoustics of Fluid-Structure Interactions, Mathematical Methods for Mechanical Sciences, Theory of Vortex Sound* and *Hydrodynamics and Sound*. From 2002 to 2007, he served as aeroacoustics editor of the *Journal of the Acoustical Society of America*.

"Professor Howe has been making outstanding contributions to the theory of aeroacoustics for almost 40 years," Mechanical Engineering Chair Ronald Roy said. "He has addressed problems ranging from the mitigation of compression waves generated by high-speed trains as they enter tunnels to the aeroacoustics of human speech. This award represents a lifetime of achievement and is richly deserved."

The Rayleigh Medal is the most recent in a long line of acoustical awards Howe has received during his career. He was named the 2006 Invitation Research Fellow of the Japan Society for the Promotion of Science and received the 1997 Rayleigh Lecturer Award and the 2000 Per Bruel Gold Medal from the American Society of Mechanical Engineers and the 2001 Aeroacoustics Award of the American Institute of Aeronautics and Astronautics.

A professor since 1992, Howe has also taught at the University of Cambridge and University of Southampton and served as visiting professor at Brown University, Stanford University, Pennsylvania State University and the CSIRO Advanced Fluid Mechanics Research Laboratory in Melbourne, Australia.

— Jason L. London

Konrad Named IEEE Fellow

Associate Professor **Janusz Konrad (ECE)** has been named a fellow of the Institute of Electrical and Electronics Engineers (IEEE) for his contributions to motion estimation and stereoscopic imaging.

"This is truly a great honor," Konrad said. "Typically, you are not honored on your first nomination. I was surprised by the positive outcome on the first recommendation."

Konrad was nominated for his achievements in digital video processing and stereoscopic and 3D imaging. In particular, he was recognized for lasting contributions to the theory of estimating motion from image sequences as well as the development of enhancement algorithms for stereoscopic and multiview visualization. His research focuses on statistical video processing for surveillance applications.

Konrad joined Boston University as an associate professor in 2000. An IEEE member since 1993, he received the *IEEE Signal Processing Magazine* Award from the IEEE Signal Processing Society in 2001. He has been an associate technical editor of *IEEE Communications Magazine* since 1998 and was also an associate editor of *IEEE Signal Processing Letters* (2002–2004) and *IEEE Transactions on Image Processing* (1996–2000). He has authored or contributed to over 200 publications, presentations and theses.

Outside of academia, Konrad has collaborated with the IMAX Corporation on 3D image conversion technology for 3D film post-production and consulted for EMC Corporation and Bell-Northern Research.

—Jason L. London

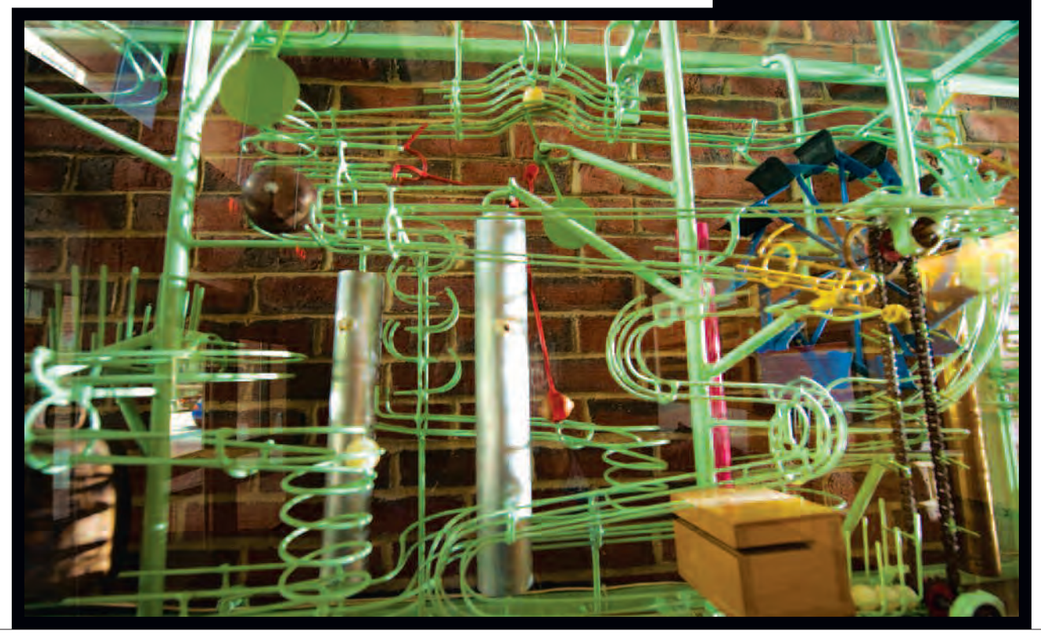
Engineering in Motion

The kinetic sculpture donated by College of Engineering alumni in 1992 has returned to a spotlighted location in the College. The work of art was commissioned from the sculptor George Rhoads, whose distinctive 'rolling ball machines' are on display in museums, hospitals and airports around the world, from Boston's Logan Airport to a Tokyo health center.

The College of Engineering's machine received a few careful touch-ups by the BU Academy FIRST team before being mounted in the recently renovated lobby at 44 Cummington Street.

"I'm thrilled it's back," said Al Muccini (ENG'62), who was instrumental in restoring the sculpture to a place of prominence in the College.

Visitors often stop to watch and listen as ping-pong sized balls course through the intricate twirls and noise-making obstacles in the sculpture that turns on for 30 minutes each hour.



Dear Alumni and Friends:

It is with great pleasure that I can report that you have made the 2007–08 Engineering Annual Fund (EAF) the most successful in the College's history, and for that you all have the very heartfelt thanks of the Dean, faculty, staff and especially the students, who are the primary beneficiaries of your gifts.

In the year closing June 30, 2008, the EAF received:

- A record $185,403 in contributions. This amount topped the previous record set in 2005–06 by more than $18,000. Even more impressive, it was $56,857 more than last year's total, an increase of 45 percent.
- Commitments from 853 individual alumni, friends and institutions, a near record and an increase of 9 percent above last year.
- A record number of leadership gifts ($1,000 or more) from 52 individuals and eight organizations; 60 total. This is 14 more than last year, or an increase of 30 percent.
- One gift of more than $25,000 and five of between $10,000 and $24,999.
- Sixty-five gifts from people who did not give in 2006–07.

Members of the Dean's Engineering Leadership Advisory Board, which was established last year and is about to hold its third biannual meeting, demonstrated their confidence in Dean Lutchen's long-term objectives as described in his Strategic Plan (available on the web at www.bu.edu/eng/about/vision) by contributing $45,250 to the EAF. In the College's history, no board has financially supported the EAF as much as this one.

All contributions to the EAF are used by the Dean to support student extracurricular and preprofessional activities like the STARS and SURF undergraduate research support programs, the Society of Women Engineers, student chapters of engineering professional societies, Engineers Without Borders and other student organizations. This year, the Dean used EAF resources to seed-fund a new Clean Energy and Environmental Sustainability Initiative.

None of this would be possible without the generosity and support of our alumni and friends who contributed to the EAF. For those who made gifts this year, you again, have our sincerest thanks. For those who were not contributors in 2007–08, there is time to join your classmates and colleagues this year! I'm hoping next year's listing of donors will require another two pages.

I've enjoyed meeting many of you in my first year here and look forward to meeting more of you this coming year.

Scott Muirhead, Ph.D.
Director, Development & Alumni Relations

The Engineering Annual Fund

The Engineering Annual Fund (EAF) enhances student initiatives by supplying funds at the Dean's discretion that extend beyond what tuition and external research grants can provide. Scholarships and stipends to support undergraduate research work such as the Summer Term Alumni Research Scholars and the Supplemental Undergraduate Research Fund programs are among the many initiatives that have benefited from the EAF. The Dean also uses the fund to support student club travel to national conferences and for special projects such as Engineers Without Borders in Peru and the BU NanoSatellite project.

Engineering Annual Fund Donors

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Roger A. Dorf ° ('70)

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Engineering Alum Repays a Debt of Gratitude

One of the perks of **Mark Tubinis'** (EE '81) last job was a view of the Eiffel Tower. By starting a company in Chelmsford, Massachusetts, the telecommunications technology entrepreneur wound up working—and living with his wife and three children—in Paris.

"It was fantastic. We lived across from the Eiffel tower. It was a great adventure and we took full advantage of it, traveling all over Europe. It was even more difficult coming back," Tubinis said.

For Tubinis, currently the chief technology officer at Cedar Point Communications in Derry, New Hampshire, his family's experience in France from 2004 to 2007 was one in a string of entrepreneurial expeditions during a journey that began with his BU College of Engineering education.

"A Trustee Scholarship enabled me to come to BU; as the fourth of five children, I wouldn't have been able to afford it otherwise. It's why I really have a place in my heart for BU. It's enabled me to have a great career," he said.

Tubinis feels it is important to maintain strong ties to the College, both in gratitude for the education it gave him in the past, and out of a desire to help grow and strengthen its programs and opportunities for incoming students of the future.

"I try to give back as much as I can over time. There is a debt of gratitude that I have. The College was perfect for me at the time I was there," he said.

"The balance the College provides between an engineering education and the liberal arts is absolutely essential today. To be a leader in an engineering field you have to be able to communicate your ideas and inspire people to do great things."

After earning his bachelor's degree in electrical engineering and a master's in computer science and electrical engineering at MIT, Tubinis embarked on a career helping to pioneer open carrier-class switching, a technology that allows large fixed and mobile phone companies to add new services to their networks in a novel way. As his career in companies large and small flourished, his family developed an annual budget for philanthropic donations to a short list of causes, including tsunami relief, cancer research and education. This year, they made a Leadership Gift to the Engineering Annual Fund.

"BU is always on my list. We typically meet twice a year as a family to talk about how to spend the budget. We're trying to teach the kids that it's good to give back when you are blessed like we are."

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Professor de Winter to Match Gifts From First-Time Alumni Donors

A faculty member since 1963, **Associate Professor Ted de Winter** has had a front-row seat as the College of Engineering has risen into the top 15 percent of the nation's engineering schools. But de Winter says one key ingredient is currently missing if the College is to continue to climb in stature: "Alumni participation."

Engineering students Ann Shedd and Adam Detwiler visit Professor de Winter.

De Winter knows the College is at a competitive disadvantage because the percentage of alumni who make donations to the College lags well behind that of other leading engineering schools. In order to jumpstart participation and renew alumni's connection with the College, he has issued the "Ted de Winter Challenge."

De Winter has committed $10,000, which will be used to match gifts of up to $100 from first-time alumni donors. This gives first-time donors the opportunity to as much as double the impact of their gifts.

Donations to the Engineering Annual Fund support out-of-the-classroom enrichment opportunities for students that go beyond what tuition alone can provide. De Winter points out that programs like Engineers Without Borders and the Energy Club have a direct impact on students, as well as alumni, who have a vested interest in the College's rising fortunes.

"Why should you give? Because there's satisfaction in giving to something identifiable and from which you can see results," he said. "If BU manages to increase its standings and respect among the academic community, this cachet really accrues to all people who have BU degrees, whether they earned them 30 years ago or last year."

To participate in the "Ted de Winter Challenge," and for more information on the Engineering Annual Fund, please visit www.bu.edu/alumni/eng/giving/.

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Mr. and Mrs. Yoshihiro Hidaka
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Mark Frederick Hodge* ('99)
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Anuj Jain‡ ('01)
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Michael H. Kagan ('83)
Jason Robert Kait ('95)
Theodore Kakavas§ ('95)
Daniel Robert Kallman§ ('94)
John D. Kariouk§ ('84)
Nicholas Kurt Katzenberger ('94)
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Michael P. Kazenel§ ('80)
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Elizabeth Kiczalis
Douglas J. Killian§ ('93)
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Judith Knoll
Keti Kondili*
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Lt. Commander Garrett Vincent Krause* ('94)
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Inessa Kuznetsova§
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Nasimatun Nahar*
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Jimmy Ng* ('07)
Tuan Anh Nguyen* ('00)
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Jacqueline Petit§ ('83)
Anthony James Pfeiffer* ('08)
Han Thanh Phan ('90)
Steven L. Picciano ('97)
Anthony Nicholas Pirri§ ('64)
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Alvin Manuel Polsky§ ('58)
Victoria Powell§
Stephanie Lynn Prager* ('08)
Elizabeth Ann Pratt* (COM'94)
Major Jason Miles Pratt, USMC* ('94)
Michael J. Pulliam ('83)
Charles W. Purcell* ('87)
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Michael Quitadamo*
Paula M. Ragan ('94)
Heather A. Rasich*^ ('06)
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George R. Sachs* ('62)
Iris Jean Takeyo Saito*
Lisa Sama*
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Denise M. Schier§ ('81)
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Sandra D. Shanaberger§ ('82)
Gene Shekhtman* ('96)
Carol Hackett Sheridan§ ('83)
Jason P. Shimshi ('90)
Gordon A. Shogren ('59)
John J. Shynk, Ph.D.§ ('79)
Frederick M. Silva§ ('94)
Gregg P. Smith* ('05)
John F. Smith§ ('63)

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^Dean's Engineering Leadership Advisory Board
‡ENG Alumni Board Member

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Jessica Ann Sonnenfeld ('04)
Thanassi Souroulides[*] ('79)
Katherine Elizabeth Spignese ('85)
Norma J. Spignese[*] (SED'81)
Arthur G. St. Germain ('50)
Paul H. Stenberg[*] ('64)
Armand Stravato[§] ('58)
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Patricia Lynn Sukrachand[§] ('83)
Lavanya Suresh[*] ('04)
John A. Svrjcek[*]
Priya Swamy[*] ('96)
Charles Mark Sweet ('91)
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John L. Tremblay[*] ('97)
Aleksey Trubitsyn[*] ('08)
Kerry Twibell[§‡] ('00)
Marc Cosimo Ubaldino[§] ('95)
Major Prospero Alexie Uybarreta, USAF[*] ('98)
Carrie A. Vinch[*] ('88)
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Patricia Ellen Volpe[*] ('88)
Tracy Steven Vonick ('89)
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Kenneth William Wagner[*] ('89)
Mr. and Mrs. Robert Maxwell Waitt[§]
Arthur M. Walker ('89)
Robert Stuart Wallace III[*] ('87)
Edmund J. Walsh Jr.[§] ('83)
Kai Fong Wang[§] ('03)
Professor Hua Wang[*†]
Cecilia Warsawski[§] ('82)
Robert M. Waters Jr.[^§] ('96)
Eliot Dennis Weinman ('85)
Jeannette Locke Wellman[§] ('87)
Sharon Lisa Westphal ('91)
Alexander David Whitnall[*] ('08)
Adrian Daniel Williams[*] ('01)
Mr. and Mrs. Wayne Williamson
Mr. and Mrs. Richard D. Wolcott[§]
Mr. and Mrs. Eli P. Wolfson[*]
Trevor Howard Wood, Ph.D. ('98)
Barry Quan Wu[§] ('86)
Jason Yoon[*] ('03)
Wei Yu ('07)
Guylherme Tobias Zaniratto[§] ('98)
Andrew M. Zaso ('90)
Mr. and Mrs. Fred Zemel[*]
Suzanne Zile[*]
Todd E. Zive ('98)
William R. Zolla[§] ('61)
Steven Henry Zysman[§] ('85)

Merrill Ebner Fund

The Merrill L. Ebner Fund was established by Roger A. Dorf ('70) and his wife, Sandra M. Dorf, as a tribute to Professor Merrill L. Ebner. Income from this endowed fund supports student-based programs that foster creative product and process design.

Ebner Donors

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Other ENG Funds

In addition to contributions for specific research projects (such as the Wallace H. Coulter Foundation Translational Research Partnership and the Henry Luce Foundation Professorship awards), the College also received support from alumni and friends for the following programs:

Anita Cuadrado Memorial Fund
Presents annual awards to one or more ENG students who best exemplify the late Assistant Dean for Undergraduate Program's spirit, commitment to the College and University, and dedication to helping undergraduates.

Adam Miller Senior Project Fund
Supports the Biomedical Engineering Department's Senior Project Program, including the annual Adam Miller Award for outstanding BME senior research project.

ENG Dean's Fund
Supports special programs, such as the annual Bourke Lecture, and other academic activities at the Dean's discretion.

Ging S. Lee Community Service Award Fund
Annually awards one or more ENG seniors who have made outstanding contributions in the area of community service. This awards honors Ging S. Lee ('70).

Other Donors

$1,000,000 or more
Wallace H. Coulter Foundation

$250,000–$999,999
The Ellison Medical Foundation
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American Heart Association
Frederic A. Bourke Jr.
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Hanna G. Evans
Handshake Solutions Inc.
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Karen Elizabeth Kullas[^‡] ('77)
Barbara Y. T. Lee ('70)
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Professor Theodore F. Morse[†]
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Mr and Mrs. Philip Tayinor

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[^]Includes Matching Gift
[§]Three Consecutive Year Donor
[°]Dean's Engineering Leadership Advisory Board
[‡]ENG Alumni Board Member

Undergraduate student volunteers David Massey and Amanda Douglas greet ENG alumni for a day at Fenway Park.

David ('94) and Heidi Giangregorio

Chris Jones and son Michael, 7

Jamie Heller, Karen Panetta ('85) and Dean Lutchen

Alumni Board member Ruth Hunter ('64) and her son-in-law Phil Paik

Stephen Campbell ('97) (left) and Chris Frail ('97)

Alumni at the Ballgame
June 7, 2008

More than 100 College of Engineering alumni gathered for the annual outing to Fenway Park. This year's attendees enjoyed a reception and saw the Red Sox trounce the Seattle Mariners, 11–3.

What are you doing?

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

1954

David W. Lowry, BS
Newtown, Connecticut
David has been elected to his fourth two-year term as a member of the Danbury Railway Museum Board of Directors. He invites all BU alumni to "stop by the DRM any Thursday for a tour of the museum and yard or a tour and train/turntable ride on Saturdays!"

1962

Pete deLellis, BS
Torrance, California
Pete has just completed his 20th year of business in the medical profession; his company provides musculoskeletal diagnostics to the medical and legal community in the Los Angeles area. Pete can be contacted at amitest1@pacbell.net.

1972

Gerald Eisler, BS, PhD '86
Albuquerque, New Mexico
Gerald reports that he is "currently on loan" to the Missile Defense Agency in Washington, D.C., after working for 30 years with Sandia National Laboratories. He can be contacted at greisle@sandia.gov.

Marsha (O'Connell) Heinz, BS
Burlington, Massachusetts
Marsha reports, "After graduating from the BU College of Engineering, I continued graduate school at MIT to complete an MS in aerospace engineering. Then I began a long career as a defense contractor supporting the Air Force and Navy. I am now employed at Hanscom AFB as a chief scientist in the space control sensors division. On a personal note, I have two children currently enrolled at BU pursuing careers in the medical field."

1978

Charles Nadel, BS
Wellesley, Massachusetts
Charlie owns and operates Advanced Energy Systems Development, a company he created in 2005 to provide renewable energy resources to residences and businesses in the Boston metropolitan area. Advanced Energy Systems Development specializes in the design and installation of solar thermal, photovoltaic and wind turbine energy generation systems. Contact Charlie at advance1@advancedenergysystemsusa.com.

1979

Jennifer (Coleman) Logan, BS, MS '80
Mount Airy, North Carolina
Jennifer writes, "I am now a family practice physician, and I'm running a rural health clinic in Westfield, North Carolina. I'm divorced and have a 19-year-old son who is a sophomore at Occidental College in Los Angeles. For fun I read, ride bikes, travel and play the piano." Jennifer can be reached at drjlo@att.net.

1980

Salah Melek, BS
Annaba, Algeria
Salah is the Chairman and General Director of FERROVIAL, a rolling stock, state-owned company. E-mail Salah at salmel2002@yahoo.fr.

1981

Katherine (Eastwood) Brousaides, BS
Middletown, Connecticut
Kathy works at General Dynamics in Groton, Connecticut, as a software engineer on submarine control systems. She received her master's degree in computer science from the University of New Haven in 1994. Kathy lives with her husband, Greg, and teenage son, Alexander, and can be contacted at kbrousaides@yahoo.com.

Rifat Cem Sivisoglu, BS, GSM'86
Elmhurst, Illinois
Cem now has 25 years of experience in industry, including high tech, with stellar firms such as Alcatel. He has held positions of increasing authority in management, sales, marketing, business development, management consulting, operations and engineering. Over the years, he has also met with numerous global business and political leaders.

Cem serves as an adjunct professor of business at Elmhurst College, a top 10-ranked Midwest comprehensive college. He is also active in local community, political and charitable efforts and is currently a candidate for the County Board of DuPage, Illinois. Keep up with his campaign at www.VoteRifat.com, on his LinkedIn profile under Sivisoglu, or contact him at sivisoglu@yahoo.com.

1983

Kelly Blasko, BS
State College, Pennsylvania
Kelly writes, "I will graduate in August 2008 with a PhD in Counseling Psychology from Pennsylvania State University. I will be working in a clinical postdoctoral position at the counseling center for the University of Michigan in Ann Arbor in 2008–2009. My dissertation was on 'Psychologists' assessment of same-sex and opposite-sex intimate partner violence.'"

Andrew Halpern, BS
Savannah, Georgia
Andrew is a quality engineer at Gulfstream. Previously, he worked at ANS Consultants.

1984

George Guerra, BS
San Diego, California
George was recently promoted to Vice President for Northrop Grumman's Global Hawk Unmanned Aerial System program. He has been with Northrop Grumman for 14 years and says, "Work is going well and living in San Diego is the best! Hope to come back soon and root the Terriers on to another Beanpot Title!" Contact him at gguerra1@san.rr.com.

Robert McKinstry, BS
Chesterfield, Missouri
Robert reports he is "Happily living in a St. Louis suburb with my spouse, Hilarie, and our daughters Meagan, 14, and Katie, 13. I serve as Radiologist-in-Chief of St. Louis Children's Hospital and Associate Professor at the Washington University School of Medicine. My research interest is imaging the developing brain and its response to injury." E-mail Robert at bobmckinstry@yahoo.com.

Edward A. Pohl, BS
Fayetteville, Arkansas
Edward will hold the John L. Imhoff Chair in Industrial Engineering at the University of Arkansas College of Engineering for the 2008–2009 academic year after being an associate professor in the college's department of industrial engineering since 2004.

1987

Jim Berthold, BS
Westford, Massachusetts
Jim and Christine Berthold announced the birth of their second child, Sabrina, on June 10th, 2008. Contact Jim at jimb@alum.bu.edu.

Thomas Karl Evans, BS
Chandler, Arizona
Thomas is the Lead Electrical Power Subsystem Engineer for the OrbView-5 (GeoEye-1) imaging satellite scheduled to launch in 2008. He also designed the electrical power subsystem used on Near Field Infra-Red Experiment satellite launched in April 2007. He and his wife have launched four kids into this world and celebrated their tenth anniversary in July 2008. E-mail Thomas at tkesquebh@netscape.net.

1988

Kevin Frye, BS
Cincinnati, Ohio
Kevin writes, "Wow, 20 years since we graduated from BU in 1988! I am the eCommerce Director for a large automotive group across three states and working in a fast-moving market. Having fun and still keeping in touch with **Chris Benoit ('88)** who is serving with the Army in Iraq, and **Mike Allen ('88)** who lives and works in New York City. Would love to hear from former friends!" Contact Kevin at k2finance@aol.com.

Dmitry Orlov BS, GRS'95
Boston, Massachusetts
Dmitry published *Reinventing Collapse: The Soviet Example and American Prospects* (New Society Publishers, 2008). Arguing that trends in the U.S. economy and foreign policy mirror those of the Soviet Union that lead to its economic collapse and political dissolution, Dmitry—who was born in Leningrad and has returned frequently to Russia since he emigrated at age 12—shows how individuals and small groups in the U.S. can survive and even thrive in spite of steadily deteriorating circumstances.

Marcia J. (Hayes) Schels, BS
Trumbull, Connecticut
Marcia is the IT Director for the Office of Development and the Office of the Secretary at Yale University. She has been at Yale since 1993. Living in Trumbull, CT, with her husband Don, Marcia has two children: Tyler, 13, and Kaitlyn, 8. E-mail her at marcia.schels@yale.edu or link on www.linkedin.com.

1989

Arthur Pantelides, BS, MS'91
Virginia Beach, Virginia
Arthur is the Engineering Manager at Sumitomo Drive Technologies. He is also finishing his doctorate degree in engineering management at George Washington University in Washington, D.C. Arthur can be contacted at arthurapx@yahoo.com.

1990

Nancy (Kohrs) LaRoche, BS
Manchester, New Hampshire
Nancy and her husband, David, announce the birth of twin daughters, Eleanor and Claire, in July 2007: "The girls are happy & healthy, just starting to cruise along now at one year." Nancy is back to work as Quality Systems Manager at DEKA R&D, where she has worked for the last six years, and says, "Hello to former classmates, especially Rochelle & Jae!" She can be reached at nlk@alum.bu.edu.

Mike McCullough, BS, MS'95
Londonderry, New Hampshire
Mike McCullough is now president and primary owner of his second engineering services company, RTETC, which specializes in embedded systems software, services and training. E-mail him at mikemc@ttlc.net.

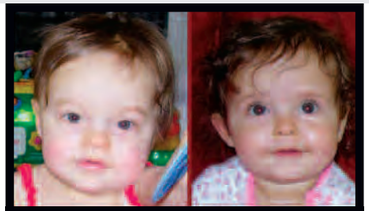
1991

David Miller, BS, MS'94
Framingham, Massachusetts
The Millers welcomed their second Terrier Hockey fan into the family on November 18, 2007. Jordan attended her first game in December, and she cannot wait to enjoy the 2008–09 hockey season with her older sister Kiersten, who has been enjoying games since the 2003–04 season.

Randy Nocks, BS
Cincinnati, Ohio
Randy writes, "This is a year filled with prime numbers: My daughter Katherine turned 7 in February. My son Alexander turned 11 in June. My wife Lisa (Sprague, CLA'91) and I will be celebrating our 17th anniversary. I completed my fifth marathon in May. I haven't done the Boston Marathon yet, but I hope to someday. In my free time I work for a consulting company called Sogeti where I help clients with project management and business analysis activities. I would be happy to hear from fellow alumni." Contact Randy at randy@nocks.com.

1992

Tom Heed, BS
Ann Arbor, Michigan
Tom Heed is President of DataGenomics, L.L.C., a technology start-up in Ann Arbor. DataGenomics focuses on supply-chain quality data services for externally manufactured electronics products (outsourced manufacturing) with high geographic dispersion. You can reach Tom at theed@datagenomics.com.



1990 **LaRoche**
Eleanor (left) and Claire

1993 **Moores**
Karen Pascarella Moores and Colton

Craig Huffnagle, BS
Fredericksburg, Virginia
Craig celebrated the birth of his daughter, Crissa Jewell, on October 19, 2007.

Ann (Pavlik) Meyer, BS, MS'98
Shrewsbury, Massachusetts
Ann and Peter Meyer (ENG PhD'03) announce the birth of their third child, Rebecca Ann, born on August 17, 2007. Her twin brothers Joe and Billy welcomed Rebecca.

Scott Riewald, BS
Colorado Springs, Colorado
Scott recently co-authored a book with Dave Salo, coach of numerous Olympic swimmers, titled *Complete Conditioning for Swimming*. The book provides detailed information on how to develop and implement strength and conditioning programs for swimmers. A member of the BU swim team from 1988–92, Scott recently began work with the U.S. Olympic Committee in their Performance Services Division, after spending the last five years with the U.S. Tennis Association. In his present position he provides performance technology and biomechanics support for Olympic-level endurance athletes. E-mail him at scott.riewald@usoc.org.

1993

Karen (Pascarella) Moores, BS
Snohomish, Washington
Karen and her husband, Chris, announce the birth of their first child, Colton Lee, on November 2, 2007. Karen writes, "Thankfully, he is a healthy, happy and content baby boy!" E-mail Karen at antkrn103@yahoo.com.

Eric Stutman, BS
Needham, Massachusetts
Eric left the high-tech world last year to open One2One Bodyscapes, a personal training center in Wayland, MA. He says, "I enjoy being a business owner and helping others get healthy!"

1994

Cecelia DeLuca, BS
Boulder, Colorado
Cecelia is head of the Earth System Modeling Infrastructure section at the National Center for Atmospheric Research in Boulder. She manages multiagency interdisciplinary teams that develop software for models of climate, space weather, hydrology and other natural systems. One of her recent projects, the Earth System Modeling Framework, is the basis for research programs within NASA and the Department of Defense. Visit www.esmf.ucar.edu to learn more.

Greg McGurrin, BS, GSM'01
Marlborough, Massachusetts
Greg and his wife, Jill Greene, welcomed their daughter, Lauren Reese, on November 24, 2007. Greg would love to hear from old friends at greg_mcgurrin1@hotmail.com.

Yim (Cheung) Niimi, BS
Watertown, Massachusetts
Yim and her husband Kazuhito Niimi ('95, MET'04) of Watertown, MA, announce the birth of twin baby girls, Emiko and Yumiko.

1995

Eric Bené, BS
Lynn, Massachusetts
Eric earned an MBA from Bentley College in 2007. The principal biomedical engineer at BD Diabetes Care, he lives with his wife and two children. Contact him at eric_bene@bd.com.

Christopher Caldwell, BS
Fanwood, New Jersey
Christopher and his wife, Wendy, announce the birth of their son, Reilly Hay, on June 14, 2008. Chris is a third-year optometry student at SUNY State College of Optometry in New York, NY, and Wendy is a middle-school counselor in Clark, NJ. Contact Chris at cnw247@hotmail.com.

Justin Latona, BS
Fort Lauderdale, Florida
Justin moved back to Fort Lauderdale in September 2007 and has taken on the position of System Sales Engineer for TriFactor, a material handling systems integrator; he is responsible for the South Florida region. Justin says, "It's great to be home and I've enjoyed networking with fellow BU alumni in the Miami area." E-mail him at jlatona4@yahoo.com.

Salvador Vega, BS
Mexico City, Mexico
Salvador is the owner of an IR Consulting Business and fast food restaurants, as well as the father of two beautiful daughters. He would like to hear from old friends from BU. Contact Salvador at staticas@hotmail.com.

1996

Garrett Smith, BS
Colomiers, France
Garrett will be attending the International Space University in 2008–2009 to obtain a Master's of Space Management degree. He is helping to pioneer the emerging personal spaceflight industry by promoting a commercial spaceport on the French Mediterranean based in Montpellier. E-mail him at garrettsmith@free.fr.

1997

Bob Hines, BS
Eglin Air Force Base, Florida
Bob has recently graduated from the United States Air Force Test Pilot School (TPS). His culminating project involved the classified evaluation of an electronic attack training pod on the F-16 Fighting Falcon. During the one-year course, he flew 30 different types of airplanes ranging from World War II-era fighters to the modern F-15E and the U-2 spy plane. He, his wife, Kelli, and their two children, Catie, 5, and Sarah, 1, were assigned to Eglin Air Force Base in Florida where he will be performing flight tests on all models of the F-15, new RADAR systems and both air-to-air and air-to-ground weapons. E-mail Bob at bkhines3@aol.com.

Sabrina Sequeira, BS
Hobart, Australia
Sabrina has two girls and lives in Australia. She recently began a PhD program in engineering and architecture. E-mail her at sabby@alum.bu.edu.

1998

Marco daSilva, BS
Malden, Massachusetts
Marco and Cynthia daSilva (SED'00), and their son Christopher announce the birth of the newest member of their family, Matthew Joseph, on May 15, 2008. Contact Marco at marco.dasilva@dot.gov.

Kristen Donaldson, BS
Chicago, Illinois
Kristen reports, "I finally did what I intended all those years ago and finished medical school! I gave up the consulting life, returned to school and graduated from the University of Illinois at Chicago in May. I start my residency in Emergency Medicine this summer in Chicago. I hope this finds everyone well and I would love to hear how life is treating you." Contact Kristen at kristen.donaldson.1998@alum.bu.edu.

Prospero Alexie Uybarreta, BS
Edwards Air Force Base, California
Prospero is a Major in the U.S. Air Force and currently a student at their Test Pilot School at Edwards Air Force Base. Previously, he served as an E-3 Instructor Pilot and the Exchange Instructor Pilot to the Indian Air Force flying Kiran jet trainers. He and his wife Janice have one daughter, Ella Grace, and are expecting a son. E-mail Prospero at prosperouybarreta@yahoo.com.

1999

Thomas Fields, BS
Wantagh, New York
Thomas and his wife, Stefanie, announce the birth of their first child, Liam Thomas, on February 11, 2008. Contact Thomas at tfields77@yahoo.com.

Mark Hodge, BS
Andover, Minnesota
Mark accepted a position with Medtronic at the Cardiac Rhythm Disease Management division in Brooklyn Center, Minnesota, as Director of Operations & Engineering. This position followed eight years of leadership positions in sales and marketing at Medtronic and other medical device companies in California. Contact Mark at mfhodge@alum.bu.edu.

Gloria (Goldberger) Linden, BS
Milford, Massachusetts
Gloria and Jonas Linden are thrilled to announce the birth of their third child, Simon Emmanuel Linden, on May 28, 2008. Gloria says, "Simon, big brother Stefan, 4, and big sister Sofia, 2, can't wait to attend BU!" E-mail Gloria at ggl@alum.bu.edu.

David Scherer, BS
Somerville, Massachusetts
David recently completed a PhD in Optical Sciences from the University of Arizona, took a 5-month, around-the-world trip, and is now employed as a principal scientist at Physical Sciences, Inc. in Andover, Massachusetts. Write to him at david.r.scherer@gmail.com.

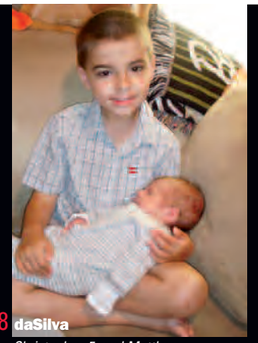
2000

Claudio Rios
Plainville, Connecticut
Claudio and his wife, Wen Sun, welcomed their darling first born, Eva Valentina Rios, on April 13, 2008. The entire family is healthy and overjoyed. You may e-mail Claudio at claudio.rios.2000@alum.bu.edu.

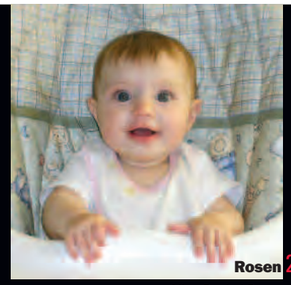
2001

Charles Blazer, BS
Reston, Virginia
Charles and Jennifer (Jones) Blazer (SAR'02, '04) were married on Cape May, NJ, on October 7, 2007. The wedding party included Paige (Melillo) Williams (COM'02), Rachel Cushing (COM'02), Katie Piaseczny (SAR'02, '04), Megan Loeschke (SAR'04), Kerry Cole (CAS'03), Eric Eng (ENG'01), David Lam (ENG'99), and Shen-Hoei Yeoh (ENG'01). Jennifer is a physical therapist and Charles is an attorney.

Douglas Chan, BS
Orlando, Florida
Douglas and his wife, Wei, announce the birth of their first child, Richard, on September 16, 2007. E-mail them at dcchan00@gmail.com.



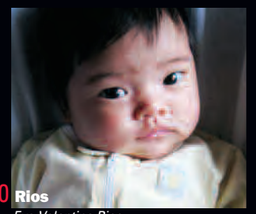
1998 daSilva
Christopher, 5, and Matthew



Rosen 2003
Alina Rachel Rosen

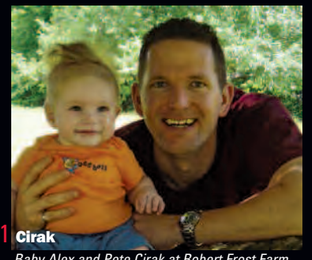
1999 Linden
From left, Sofia, 2, Stefan, 4, and baby Simon Linden

Schauble 2003
Paul Schauble TA reunion

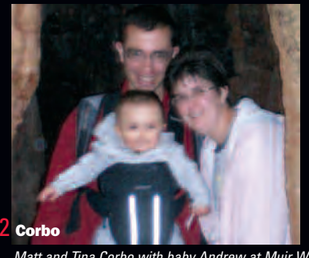


2000 Rios
Eva Valentina Rios

Dianis 2004
Allison and Scott Dianis



2001 Cirak
Baby Alex and Pete Cirak at Robert Frost Farm



2002 Corbo
Matt and Tina Corbo with baby Andrew at Muir Woods

Pulver 2006
Benjamin and Deborah Pulver

Pete Cirak, BS
North Andover, Massachusetts
Pete reports that his son Alex was born February 5, 2008, at 9 lbs 9.5 ounces "with a full head of hair that makes him look like he's going 200 mph sideways." Contact Pete at pcirak@comcast.net.

Jerome W. McDonald, BS
Baltimore, Maryland
Jerome was named a Modern-Day Technology Leader at the 22nd annual national Black Engineer of the Year Awards Conference in February. Jerome is a test engineer at Applied Signal Technology. E-mail him at jerome.w.mcdonald@gmail.com.

Shane Migliore, BS
Albuquerque, New Mexico
Shane recently completed a PhD in Electrical Engineering at Georgia Tech. He is currently working for Sandia National Laboratories in Albuquerque, specializing in the navigation, guidance and control of flight vehicles. Contact him at shanemigliore@gmail.com.

Eric Zacharek, BS
Boston, Massachusetts
Eric recently finished the first year of his MBA at MIT Sloan School of Management and worked at a summer internship in Manhattan at McKinsey & Company. Contact him at eric.zacharek@sloan.mit.edu.

2002

Matthew Corbo, BS
Pleasant Hill, California
Matthew and Tina (Lewis) Corbo ('02) are proud to announce the birth of their son, Andrew Thomas, on September 15, 2007. Mom, dad and baby are all doing great. Matt is currently working as an Optical Manufacturing Engineer for ASML Optics. Contact us at matthew.corbo.2002@alum.bu.edu and tina.lewis.2002@alum.bu.edu.

Patrick Murphy, BS
Princeton, New Jersey
Patrick received an Association of Princeton Graduate Alumni Teaching Award, given to Princeton graduate students with outstanding abilities as teachers. Patrick, who teaches integrated circuitry, electronic circuitry, and introductory photonics in the department of electrical engineering, was cited for his patience and communication skills with both science and nonscience students.

2003

Phil Li, BS
Lynnfield, Massachusetts
Phil is the new Director of Operations at Precision Motion Instruments, where he will be responsible for all aspects of manufacturing and operations in the Westborough, Massachusetts, factory after holding positions of increasing responsibility in engineering, manufacturing and quality. Precision Motion Instruments is a global precision motion control company specializing in factory automation capital equipment for semiconductor, flat panel display, data storage and medical device industries. Phil also began pursuing his MBA in financial policy part time at Boston College in the fall of '08.

Jennifer Ozog, BS
Le Locle, Switzerland
Jennifer is on a six-month assignment in Switzerland with her employer, Johnson & Johnson.

Josh Rosen, BS
Baltimore, Maryland
Josh and his wife Terri (Tenenbaum) Rosen (COM'01) announce the birth of their New Year's baby, Alina Rachel, on January 1, 2008.

Paul Schauble, BS
Salt Lake City, Utah
Paul reunited with fellow former engineering teaching assistants (from left to right) Suzanne Chan ('05), Eileen Leung (BS '05, MS '06), Marna Eckels ('02), Arek Slanda ('02), Guy Thompson (BS '04, MS '06), Professor Stormy Attaway, Paul, and Vin Kowalczyk (computer science '03). The group gathered in April of 2007 at Professor Attaway's New Hampshire home. Paul works as a manufacturing engineer for Northrop Grumman when he's not busy bicycling, skiing or hiking. He hopes to orchestrate a TA reunion again sometime in 2008. Contact him at schaubleclean@gmail.com.

2004

Allison Bell, BS, and **Scott Dianis,** BS
Durham, North Carolina
Allison and Scott Dianis (both '04) married on May 27, 2007 in Nyack, New York. Classmates Inge Tamm-Daniels ('04) and Rachel Seraspe ('04) were in the wedding party.

Robert Hardy, BS
Boston, Massachusetts
Robert Hardy is pursuing an MBA at the Sloan School of Management at MIT and an MS in Mechanical Engineering at MIT. He received the Leaders for Manufacturing Fellowship (lfm.mit.edu) to study both engineering and management with a focus on global operations. His most recent position was in manufacturing engineering at Raytheon Company.

2006

Benjamin Pulver, BS
Baltimore, Maryland
Benjamin and Deborah Moody Pulver (CAS'06) were married on May 24, 2008, in New Hope, PA; Jason Lim (ENG'04), Christy Foley (COM'06), and Rebekah Gensure (ENG'05) attended. Ben is an industrial engineer for UPS and Deb is a student at the University of Maryland School of Medicine. Contact her at dmood002@gmail.com.

2007

Ilya Gribov, BS
Tucson, Arizona
Ilya is working as an electrical engineer for Raytheon Missile Systems in Tucson, Arizona. Contact him at gribov@alum.bu.edu.

By Michael Seele

Remembering College of Engineering Icon Merrill Ebner

Professor Emeritus Merrill L. Ebner, one of the key figures in Boston University College of Engineering's transformation and the creator of the field of manufacturing engineering, died on March 27 after suffering a heart attack at a University recognition dinner where he was to be honored. He was 76.

"Merrill was an icon," said College of Engineering Dean Kenneth R. Lutchen. "The Boston University College of Engineering would not be where it is today without his numerous and enduring contributions during a career that spanned five decades. Merrill was loved and respected by generations of students and colleagues. I personally will be forever grateful to him for his friendship and mentoring when I first arrived at BU as a junior faculty member 24 years ago. We are saddened by his loss but comforted to know that students will benefit from Merrill's legacy for many years to come."

When Ebner was recruited to join the Boston University faculty in 1964, the College of Engineering had only recently been created, having changed its name from the College of Industrial Technology the previous year. Ebner was among a small group of faculty hired in the early 1960s who would play transformational roles in the College's development. He served as the first chair of the Manufacturing Engineering Department and for more than 40 years, every undergraduate who passed through that program took at least one course with Ebner. In the early 1970s, as dean ad interim, his skill and engaging personality helped reverse declining enrollment at the College.

One of his students, Roger Dorf ('70), established the Merrill L. Ebner Fund in 2003 to benefit student-based programs that encourage creative design in manufacturing engineering.

In 1996, Ebner took over the College's Distance Learning Program, which, at the time, consisted largely of satellite-fed lectures delivered to students gathered in conference rooms.

As he prepared to retire in 2006, Ebner was fine-tuning software that allowed students to have real-time audio and video interaction with their professors and classmates from a laptop; that software is now in use.

Ebner continued to be a presence at the College of Engineering even in retirement. He worked with undergraduates on their required Senior Design Projects, kept a hand in the Distance Learning Program, continued to foster the Merrill L. Ebner Fund's development, and worked on translating two-dimensional software images into three-dimensional shapes.

The College community will remember Ebner at a symposium on the future of engineering to be held in his name on Friday, October 24. For information, or to make a donation to the Ebner Fund in his memory, contact the College's Alumni & Development Office at engalum@bu.edu.

PASSINGS

Robert E. O'Shaughnessy ('58)
Bonita Springs, FL

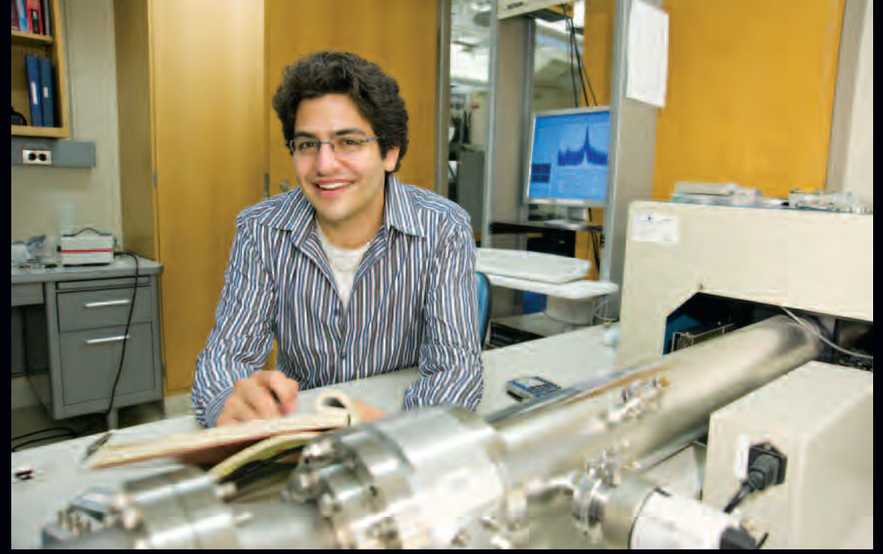
R. Glenn Stefano ('60)
Glen Ellyn, IL

Howard A. Corbishley ('66)
Pawtucket, RI

Oliver S. McBride ('67)
Northborough, MA

Alfred D. Bhaskar ('84)
Helmetta, NJ

J. Laurens Schalekamp ('99)
Cambridge, MA



Making STARS Through the Engineering Annual Fund

The Summer Term Alumni Research Scholars (STARS) program provides a stipend and on-campus housing for ENG undergraduates engaged in full-time summer research with a College of Engineering faculty mentor.

"This is my second summer working in a nanoscale research laboratory with Professor Kamil Ekinci. To me, what I've learned in the lab at Boston University is just as valuable as what I've learned in the classroom. There's nothing like getting hands-on experience.

"I'm from out-of-state and housing is so expensive here, so I'm grateful that there's a program like this that allows me to continue what I've learned in a great working environment. Because of STARS, I'm probably going to continue this research into graduate school and beyond."

Charlie Lissandrello, Levittown, New York
Mechanical Engineering '09

The Engineering Annual Fund enhances the educational experiences of ENG undergraduates outside of the classroom. Relying on alumni donations, the fund supports essential programs and activities that extend beyond what tuition and external research funding can provide.

STARS is one many of programs supported by the Engineering Annual Fund. Gifts of any size are put to immediate use to benefit student organizations, career mentoring, volunteer opportunities and many other initiatives.

To make your secure online donation, visit
www.bu.edu/alumni/eng/giving/index.html.

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Soumendra Basu

PhD, MIT, Materials Science
Professor of Mechanical Engineering

"The scale at which we manipulate the structure of materials is getting smaller and smaller," says Professor Soumendra Basu. "We are now engineering molecular or nano-scale structures, and that requires imaging at the atomic scale. My expertise in electron microscopy allows me to do exactly that.

"The most exciting part of my research in photonic and energy materials is that it ranges from fundamental studies of how light-emitting silicon nano-crystals form to applied research on designing coating systems to make gas turbines more efficient.

"BU has a culture of interdisciplinary research and education, with physicists, chemists and engineers all involved in cutting-edge materials research. The creation of graduate degree programs in the new Division of Materials Science & Engineering will continue to facilitate this collaborative atmosphere. I am delighted to be involved in these exciting new programs that will enable students from diverse backgrounds to tackle the materials challenges of the twenty-first century."