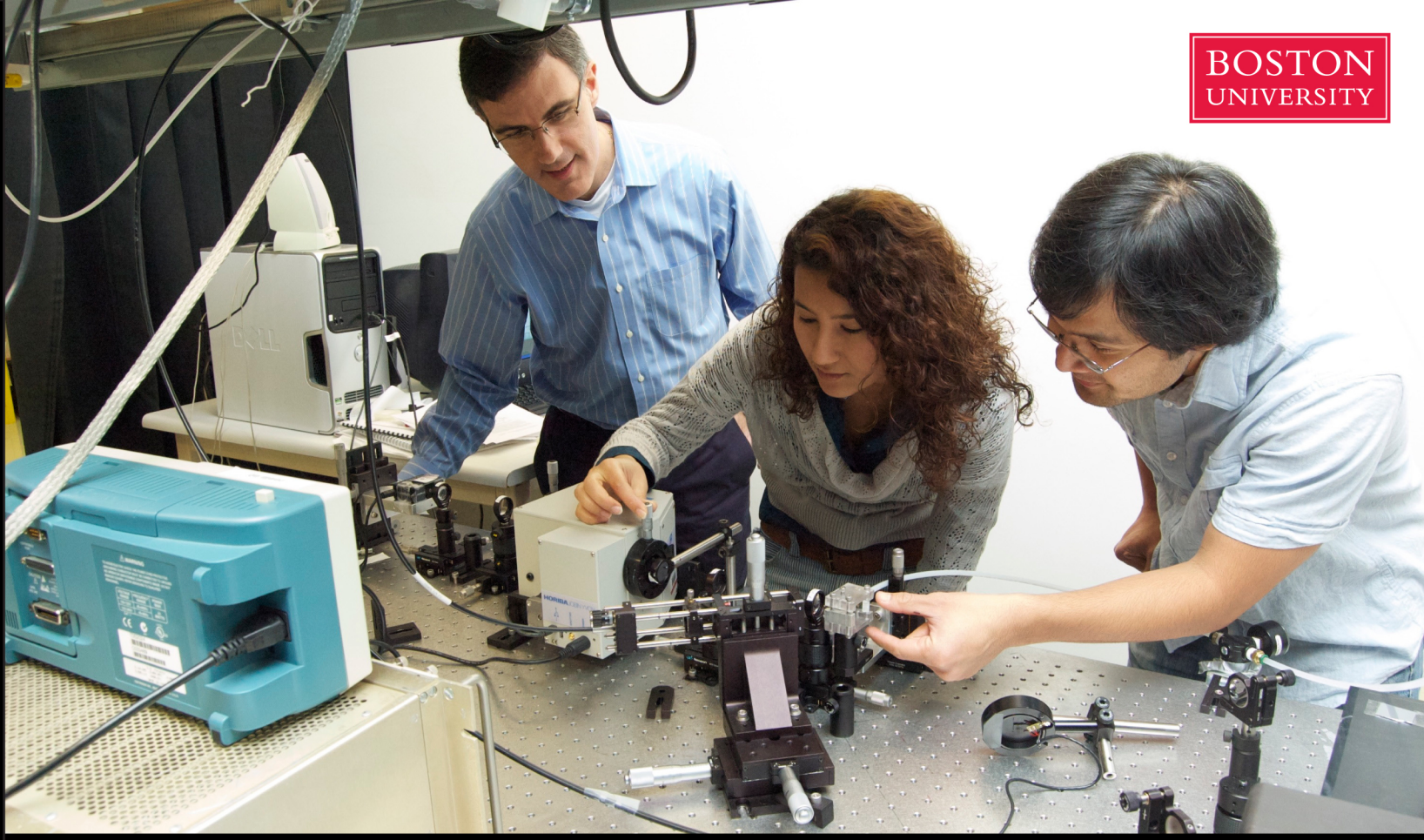

BOSTON UNIVERSITY

Boston University College of Engineering
Department of Electrical & Computer Engineering

Annual Report 2011–2012

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Department of Electrical & Computer Engineering
Annual Report 2011–2012

Production: Sneha Dasgupta (COM '13) and Rachel Harrington
Content: Caleb Daniloff, Sneha Dasgupta (COM '13), Mark Dwortzan, Samantha Gordon (COM '12), Rachel Harrington, Courtney Humphries, Michael G. Seele, ECE staff, and ECE faculty

Front cover: Top photo- Pictured from left, Professor Roberto Paiella, Cicek Boztug (PhD '14), and Faisal Sudradjat (PhD '12) work to improve the efficiency of light emission to allow for laser development from group-IV semiconductors. Bottom photo - Undergraduates in Assistant Professor Ajay Joshi's EK131: Introduction to Engineering work together on their final projects.

This report provides a look into the Department of Electrical & Computer Engineering at Boston University during the 2011–2012 academic year. Instructional activities are reported from the Fall 2011 through Summer 2012 semesters while scholarly activities and budget information are reported from July 1, 2011 to June 30, 2012.

Boston University's policies provide for equal opportunity and affirmative action in employment and admission to all programs of the University.

For more information or to download this report as a PDF, please visit our website at www.bu.edu/ece.

A Message from Our Chair

This was an excellent year, marked by an important milestone, for Boston University's ECE Department. In May 2012, we celebrated the 20th anniversary of the College of Engineering's PhD program with a strong graduating class of 19 PhD students mentored by our ECE faculty. Over the past 20 years, ECE has successfully restructured its mission from an undergraduate education focus to a world-class research department with strong undergraduate and graduate programs.

Our faculty received significant professional recognition this past year. Christos Cassandras was named president of the IEEE Control Systems Society, making him the third member of our faculty to lead an IEEE society. Clem Karl became Editor-in-Chief of the *IEEE Transactions on Image Processing*. This makes him the third member to serve as Editor-in-Chief of a major IEEE journal. Hatice Altug received the Optical Society of America's Adolph Lomb Medal and was named to Popular Science's Brilliant 10 list. Cassandras also received the Control Systems Technology Award for his design and commercial development of the discrete event and hybrid system simulator, SimEvent. Our faculty also received significant internal recognition, with Mark Horenstein named the College of Engineering's Outstanding Professor of the Year and Ioannis Paschalidis chosen by the College of Engineering as the 2011 Distinguished Faculty Fellow.

The Department had another excellent year in acquiring research funding, even as the funding from the fiscal stimulus programs decreased. This year's new grant funding totaled approximately $12,900,000, which was an increase of 5% over the previous year. Two of our young faculty, Ayse Coskun and Ajay Joshi, received NSF CAREER awards. Doug Densmore, another recent hire, received significant NSF, DARPA and ONR awards to support his design techniques for synthetic biological systems. Other significant highlights include the establishment of a new Center of Excellence, supported by the Army Research Laboratory, aimed at the design of innovative materials and power sources for the Army and a new MURI award integrating ECE and Biomedical Engineering capabilities.

Our graduate programs continue to grow, with an incoming class of 21 new PhD students and 100 new students in our Master's program. Many of these Master's students are enrolling in our new Master of Engineering programs, which provide a rigorous curriculum that can be completed in one year. Our undergraduate enrollments are increasing, with significant interest from students choosing ECE as a double major or a minor in combination with other degrees. This year, we introduced an undergraduate concentration in technology innovation for engineers with entrepreneurial orientations, in collaboration with the School of Management.

Three of our esteemed colleagues left the ranks of the core faculty this year. Mal Teich and Ted Morse moved to emeritus status after many years of service, while Bill Oliver changed to Research Professor. Mal will continue his research collaborations with colleagues at Boston University and with our former Department Chair, Bahaa Saleh, who is now the Dean of CREOL at the University of Central Florida. Ted will continue working with our undergraduate senior design teams, developing prototypes for health care.

We recruited two new faculty members into the department: Michelle Sander and Jonathan Klamkin, who will expand our research program in the Photonics and Materials areas. Michelle's research is on the design of a new generation of laser devices that can have much higher pulse repetition rates than existing lasers. Her research on femtosecond soliton fiber lasers is of great interest to our ongoing work in ECE on optical fibers and systems for communications. Jonathan's research is on the design of novel photonics integrated circuits and devices for applications such as long distance laser communication and biomedical imaging. His research interests overlap the Division of Materials Science, working on different techniques to grow materials with desirable quantum well structures. We are looking forward to their contributions in future years as they establish their research programs.

In summary, our ECE Department's growth continues. I look forward to a new year as Chair of the Department and thank my colleagues, students and staff for their contributions to our mission and growth.

David A. Castañón

David Castañón
Department Chair
November 2012

» electrical & computering engineering at a glance «

NUMBER OF STUDENTS ENROLLED

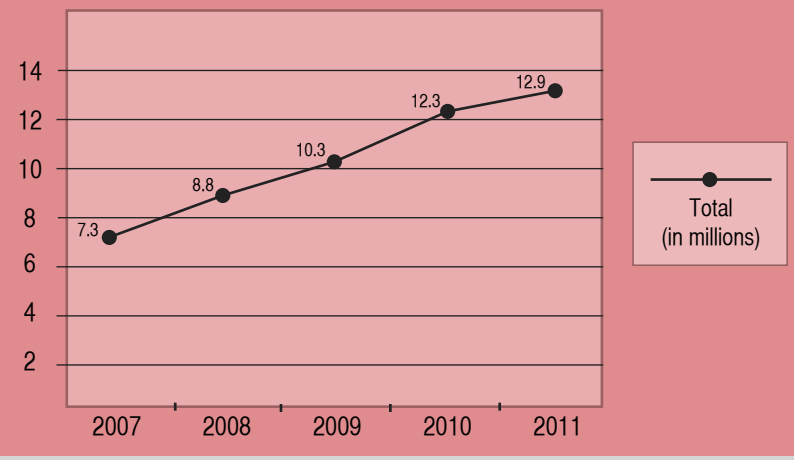
Undergraduates: 258
MS: 107
MEng: 33
PhD: 101

NUMBER OF DEGREES AWARDED

Undergraduates: 65
MS: 81
MEng: 9
PhD: 19

RESEARCH FUNDING

HISTORY OF EXTERNAL FUNDING

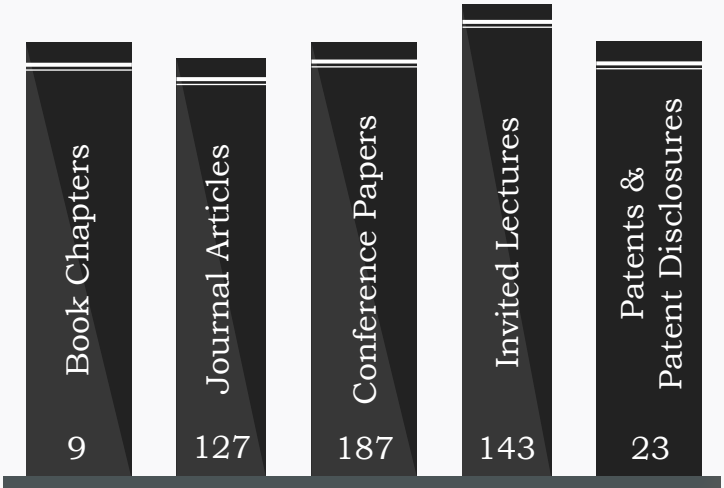


Total Grant Funding: $12.9M

Average Amount Per Faculty Member: $243,396

OUR 2011-12 FACULTY INCLUDE:

National Academy of Engineering Members (2)
Current Presidents of IEEE Societies (1)
Former Presidents of IEEE Societies (2)
Professional Society Fellows (16)
Editors-in-Chief of Scientific Journals (3)
Former Editors-in-Chief of Scientific Journals (2)
Chairs of Upcoming Conferences (2)
2012 NSF CAREER Winners (2)



NUMBER OF PUBLICATIONS BY FACULTY

2011-2012 Department Highlights

Research and Grants

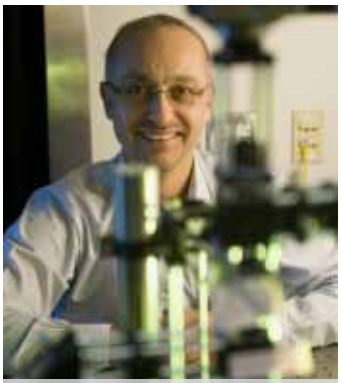
Boston University Wins $5M Grant to Develop Point-of-Care Viral Diagnostic Chip

Technology Developed at BU to be Tested at Texas Lab

The National Institutes of Health has awarded $4.8 million to a team of Boston University engineering and microbiology researchers to advance a chip-sized, low-cost, easy-to-use virus detection platform capable of rapidly detecting, at the point of care, the most lethal viral pathogens – particularly those, such as Ebola and Marburg, known to cause hemorrhagic fever. The technology developed at BU will be tested at a biosafety facility in Texas.

Led by BU School of Medicine, Assistant Professor and principal investigator John Connor, BU College of Engineering Professor Selim Ünlü (ECE, MSE) and Associate Professor Hatice Altug (ECE, MSE) will refine virus detection platforms they have developed independently. BU Engineering Associate Professor Catherine Klapperich (BME, MSE) and Research Assistant Professor Mario Cabodi (BME) will further advance microfluidics technology they've designed to integrate sample preparation in each of the two platforms. The BU researchers will partner with Becton Dickinson, a leading global medical technology company, to transform one of the virus diagnostic platforms into a working prototype, and enlist University of Texas Medical Branch Professor Thomas Geisbert, an internationally recognized expert on viral hemorrhagic fever diseases, to test it in his lab in Texas.

"We brought together this interdisciplinary team in order to develop a breakthrough detector system that will allow a simple test for the presence of viruses," said Connor. "To do that we are trying to get rid of the need for enzymes or fluorescent labels and are building nanoscale platforms that can look for multiple viruses at the same time. The detectors that we are developing will be small and portable, making them easy to take to the site of an outbreak."



Professor Selim Ünlü (ECE, MSE) with IRIS, a pathogen detection platform

Overcoming the extensive and costly training, sample preparation, refrigerated transportation and laboratory analysis that's typical of conventional virus detection technology, these platforms promise to provide fast, point-of-care, fully-integrated diagnostics in clinical and field settings – dramatically improving our capability to confine viral outbreaks and pandemics.

Two Pathways to an Integrated Virus Detection Platform

In separate research collaborations with Connor, Ünlü's and Altug's streamlined biosensor platforms have already shown great promise in pathogen detection capability.

Developed by Ünlü's research group, the Interferometric Reflectance Imaging Sensor (IRIS) can pinpoint single virus and other pathogen particles quickly, accurately and affordably. The shoebox-sized, battery-operated device is the first not only to provide rapid detection of single nanoparticles of interest, but also to measure their size – an important factor in confirming the identity of a suspected pathogen and rejecting dirt or other contaminants. To detect and size pathogens, IRIS shines light from multi-color LED sources on nanoparticles bound to the sensor surface. Light reflected from the sensor surface is altered by the presence of the particles, producing a distinct signal that reveals the size of each particle. Configured with a large surface area, the device can capture this telltale response for up to a million nanoparticles at a time.

Altug's platform rapidly detects live viruses from biological media with little to no sample preparation. It's the first to detect intact viruses by exploiting arrays of apertures of about 250 to 350 nanometers in diameter on metallic films that transmit light more strongly at certain wavelengths. When a live virus binds to the sensor surface, the effective refractive index in the close vicinity of the sensor changes, causing a detectable shift in the resonance frequency of the light transmitted through the nanoholes. The magnitude of that shift reveals the presence and concentration of the virus in the solution.

"Both of these techniques promise to overcome the limitations of conventional virus detection methods that require expensive equipment, relatively long process times, and extensive training to use," said Ünlü. "Under the new NIH grant, our goal is to produce a highly sensitive, user-friendly, commercially-viable virus detection system that can be deployed at the point of care and detect viruses in about 30 minutes."

To produce a fully integrated, point-of-care system, the researchers plan to incorporate a microfluidic sample preparation chip to work with Ünlü's and Altug's virus detection platforms. The goal for the microfluidics team is to improve the quality of the sample introduced to the sensing surface, by purifying, then concentrating, the starting sample solution.

"By leveraging Klapperich's work in low-cost, disposable diagnostics and our collective expertise in microfluidic separation and purification techniques, we'll seek to improve the overall performance of the diagnostic platforms, while retaining speed of analysis and a compact format," said Cabodi.

Toward a Commercially Viable Prototype

Within five years, the researchers plan to validate multiple harmless test viruses on the two evolving microfluidics-enhanced diagnostic platforms, develop one of the platforms into a commercially viable prototype, and validate the prototype on pathogens in Geisbert's Texas biosafety lab, which employs the highest degree of biocontainment precautions to isolate dangerous biological agents.

The final prototype should consist of a small "detector" chip containing integrated microfluidics that allows samples to be drawn over the active sensing components, and a working "reader" capable of rapidly reading the detector chips and providing diagnostic information. The system should be able to simultaneously assess multiple possible infectious agents with minimal sample handling and be suitable for clinical use in resource-limited countries.

-Mark Dwortzan

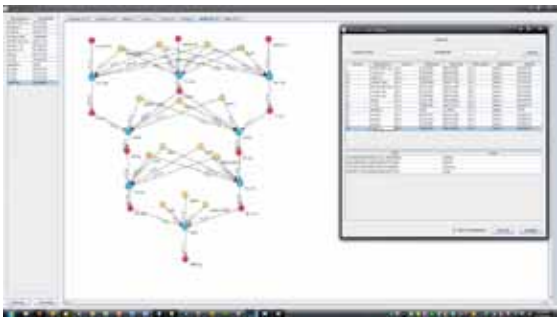
NSF Awards Densmore $1.1M for Clotho Research

In 2007, Assistant Professor Douglas Densmore (ECE) and his research team at the University of California, Berkeley, started working on software that could engineer synthetic biological systems and improve how the data behind them was managed. Their work had the potential to improve disease diagnosis and treatment.

Five years later, their research is still going strong. This year, Densmore was awarded a three-year grant totaling $1.1 million from the National Science Foundation's Advances in Biological Informatics (ABI) for his open source platform, better known as Clotho.

"We're very excited to work with NSF to take Clotho to the next level," said Densmore. "This will start paving the way for Clotho to go from a proof of concept to viable commercial software."

The project includes collaborations with researchers at Boston University, UC Berkeley, the University of Washington, and BIOFAB. Professor J. Christopher Anderson of UC Berkeley is a co-principal investigator on the grant and a co-founder of the Clotho framework.



Clotho helps manage complex DNA assembly processes by capturing the biological protocols formally and providing commands to liquid handling robotics for their physical assembly and sample tracking.

Clotho presents a set of modular Apps for the specification, design, and assembly of novel biological systems. Apps are included with the software or can be written by the larger community.

Clotho uses an App environment similar to an iPhone so that anyone can share and create new tools. At the same time, it provides a mechanism to begin the process of creating standardized data, algorithms, and methodologies for synthetic biology.

The grant will provide Densmore and his research team with funding that will allow them to complete the development of the software. Their App store will serve as both a portal for Clotho development and a community resource.

Previously, Clotho acted as an educational resource by providing students with a chance to develop their own automated design software. Using Densmore's platform, a team made up of Boston University and Wellesley College students used Clotho to create software tools that could potentially lead to more effective diagnostics and drugs for tuberculosis. They went on to win the "Best Software Tool" prize at the International Genetically Engineered Machine (iGEM) World Jamboree at MIT.

-Rachel Harrington

Intelligent Robots May Be Here Sooner Than You Think

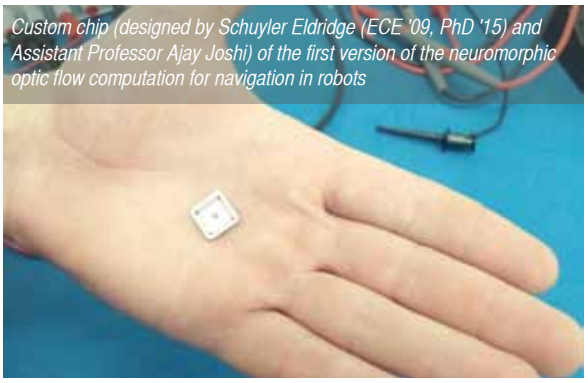
Building a robot that's smarter than any other ever created sounds like a big goal, but that's the purpose behind work by Massimilano "Max" Versace (GRS '07), a research assistant professor at Boston University, and Ajay Joshi, an assistant professor in the Department of Electrical & Computer Engineering (ECE).

Currently, the learning ability of software programs and robots is limited by their programming and the need to think in advance about any possible scenarios the robots might encounter. In *BU Today*, Versace dubbed this "special-purpose intelligence" and said that his group is shooting for something more advanced.

In summer 2010, Versace launched the Neuromorphics Lab as part of the National Science Foundation-funded Center of Excellence for Learning in Education, Science, and Technology. The goal of the research group is to design a new type of computer that can sense, learn, and adapt – just like a living brain.

The Neuromorphics Lab's main model, called MoNETA (Modular Neural Exploring Traveling Agent), is a large-scale software simulation of a biological brain designed by a team led by Professor Anatoli Gorchetchnikov (GRS '05), a CAS research assistant professor. MoNETA is able to learn from experience rather than being programmed to react to its environment.

"We want to eliminate, as much as possible, human intervention in deciding what the robot does," Versace told *BU Today*. To be useful in robotic applications, MoNETA needs a "brain," or a computing substrate, to support the system.



Custom chip (designed by Schuyler Eldridge (ECE '09, PhD '15) and Assistant Professor Ajay Joshi) of the first version of the neuromorphic optic flow computation for navigation in robots

Joshi and Schuyler Eldridge (ECE '09, PhD '15) are designing the low-power custom chips that implement the neural algorithms in MoNETA.

"Building this hardware is rewarding but challenging," said Joshi. "It's tough to get all of the algorithms we need on one chip."

Before Joshi started collaborating on the project just under two years ago, he had been interested in seeing how his ECE research could be linked to biology but wasn't sure what direction to take. Then, Franco Cerrina, who served as the ECE Department Chair until he passed away in 2010, introduced him to Versace.

"What intrigued me most about this project was that the algorithms had a learning capability," Joshi said. "This is a really interesting component when you think about how it can be applied to hardware."

Truly a shared project, there are many other researchers involved, too. Gorchetchnikov is producing algorithms that create lifelike behavior without specifically telling a robot what to do. Others are looking at brain function. Postdocs Gennady Livitz (GRS '11), Jesse Palma (GRS '11), and Research Associate Aisha Sohail are working on the visual systems, while Professor Heather Ames leads the group effort in technology outreach and commercialization via the CELEST Catalyst.

"We are a bridge between neuroscience and engineering," Versace told *BU Today*. "We are fluent in both languages. We can talk neurotransmitters and molecules with biologists and electronics and transistors with engineers."

Researchers on the project are from a wide range of backgrounds, including neuroscience, psychology, biology, computer science, engineering, and math.

-Rachel Harrington
Courtney Humphries also contributed to this article.

Two ECE Faculty Win NSF CAREER Awards

Assistant professors Lorena Barba (ME), Ayse Coskun (ECE), Ajay Joshi (ECE) and Michael L. Smith (BME) have each received the National Science Foundation's prestigious Faculty Early Career Development (CAREER) award in recognition of their outstanding research and teaching capabilities.

The five-year, $400,000 - $550,000 award funds high-impact projects that effectively combine research and educational objectives. The NSF recognized Barba, Coskun and Joshi for three independent efforts to stretch the limits of computing, and Smith for innovative research on intercellular communication.

High-Performance Computing Research Nets Three Awards

Both Coskun and Joshi will use their CAREER awards to address rising performance and power demands on computer hardware. The need is critical as today's inefficient technology imposes steep operational and cooling costs on data centers and high performance computing (HPC) clusters, and appears unlikely to meet the high performance demands of next-generation embedded systems.

Coskun's goal is to demonstrate that 3D stacked systems, in which multiple chips are manufactured and vertically connected, will provide major efficiency improvements to the nation's computing infrastructure, leading to substantial cost and carbon footprint reductions.

"Our objective is to create the catalyst techniques required to make 3D systems effective agents for attaining low-power, high-throughput computing in both embedded systems and HPC/data centers," said Coskun.

Joshi will apply his award to boost the energy efficiency of silicon-photonic manycore systems, which consist of dozens of independent, silicon-based processors operating in parallel and communicating with system memory via photonic links.

"This will pave the way for rapid adoption of silicon-photonic networks for processor-memory communication, which will significantly improve the energy efficiency – and, in turn, reduce the operational cost and carbon footprint of – manycore systems widely used today in server farms and data centers," Joshi explained.

New Educational Initiatives

The NSF CAREER award funding will also enable Barba, Coskun, Joshi and Smith to redouble their efforts to provide innovative educational experiences to College of Engineering students and expose K-12 students to the excitement of engineering. Key initiatives they have planned include the development of leading-edge educational technologies; advanced studies institutes that promote international, interdisciplinary collaboration; new courses; new interactive, hands-on design challenges; and new undergraduate research opportunities.

To date, 31 College of Engineering faculty members have received NSF CAREER awards during their service to the College.

-Mark Dwortzan


Lorena Barba


Ayse Coskun


Ajay Joshi


Michael L. Smith

Taking Some Weight Off the U.S. Army's Shoulders

Members of the U.S. armed services already face enough challenges in their day-to-day work. Some of these problems are unavoidable but being weighed down by up to 35 pounds of batteries is one hindrance that the Army Research Laboratory (ARL) believes can be solved.

Boston University will partner with the ARL in a $15 million University of Utah-led effort aimed to use computer simulations to create materials for lighter, more energy-efficient devices and batteries. As soldiers increasingly rely more on electronic weaponry, detection devices, protection systems, and advanced communications systems, this project becomes both more timely and necessary.

BU will receive about $3.5 million to focus on the electronic and photonics materials portion of the project while Utah will research electrochemical materials and devices and Rensselaer Polytechnic Institute, the other main partner institution, will focus their work on heterogenous materials.

"The fact that our team has an important role in this project means that the research conducted at BU is receiving significant recognition outside the university," said Associate Professor Enrico Bellotti (ECE), who paved the way for BU's role in this partnership and is one of the members of the project's alliance executive committee. "We think that this program is a great opportunity to further the outside visibility of the department and the research that is carried out in our groups."

As part of BU's role on the project, Bellotti, Professor Francesco Bertazzi of Politecnico di Torino, Italy, and Professor Efthimios Kaxiras from Harvard University will focus their research on developing simulation models of electronic materials, specifically wide band gap semiconductors, that can be used by the U.S. armed services. Associate Professor Luca Dal Negro (ECE) and Professor Giuseppe Vecchi, Politecnico di Torino, will develop new approaches for designing smaller and more efficient electromagnetic devices for energy harvesting, and Associate Professor Martin Herbordt (ECE) will provide his expertise in parallel computing since computers will play a key role in developing the simulation models.

"The work on batteries and fuel cells will potentially lead to energy storage devices that possess a higher power density than what is available now and can operate in a wider range of environmental conditions," said Bellotti.

The collaboration includes not only BU, Utah, RPI, and Politecnico di Torino, but also Pennsylvania State University, Harvard University, Brown University, and University of California, Davis. Combined, these universities will form the Alliance for Computationally-Guided Design of Energy Efficient Electronic Materials, or CDE3M for short.

Ultimately, this new research effort aims to use powerful computers to simulate the behavior of materials on multiple scales in order to develop better, lighter power supplies. Improving existing materials is also a goal.

"We want to help the Army make advances in fundamental research that will lead to better materials to help our soldiers in the field," says computing Professor Martin Berzins, principal investigator from the University of Utah.

Bellotti said that their research has the potential to be applied not only by the military but also by automotive and green energy industries.

-Rachel Harrington


Enrico Bellotti


Luca Dal Negro


Martin Herbordt

Faculty

Cassandras Receives the 2011 IEEE Control Systems Technology Award

Christos Cassandras

This year's IEEE Control Systems Technology Award, which recognizes outstanding contributions to control systems technology, was awarded to Professor and Head of the Division of Systems Engineering, Christos Cassandras (ECE/SE), at the Conference on Decision and Control (CDC). He was honored for his design and commercial development of the discrete event and hybrid system simulator, SimEvents.

Cassandras and research partner, Michael Clune of The MathWorks, collaborated between 2003 and 2008 on SimEvents, which allows users to simulate event-driven processes along with time-driven ones – for example, the stages of a manufacturing process – so that bottlenecks can be identified and resource requirements can be determined. The program also facilitates the design of hardware architectures, distributed control systems, and sensor and communication networks for aerospace, automotive, and electronics applications among many others.

"I'm very pleased to see a large part of my research in discrete event and hybrid systems turned into a product useful to many," Cassandras says of his work with Clune. "I think this collaboration between The MathWorks and myself is recognized at this level – it promotes a good model for academia-industry cooperation."

This CDC celebrated its 50th anniversary December 12-15, 2011, in Orlando, Florida.

-Samantha Gordon (COM '12) and Rachel Harrington

Professors Mazumder, Toffoli Become IEEE Fellows

The Institute of Electrical and Electronics Engineers (IEEE) Board of Directors have named ECE Professors Malay Mazumder and Tomasso Toffoli as IEEE Fellows, effective January 1, 2012.

According to the IEEE website, Mazumder was selected "for contributions to self-cleaning solar panels, and particle size and charge distribution analysis" while Toffoli was chosen "for contributions to theory of computing including reversible computing, cellular automata, and physics of computation."

Toffoli, who earned a PhD in physics from the University of Rome as well as a PhD in computer and communication sciences from the University of Michigan, said that he was very happy to be recognized by the engineering community.

Malay Mazumder

"Most of my work has consisted not in trying to find an answer to questions that other people have asked, but rather in raising questions that no one else had formulated and trying to answer them because they looked important – and fun – to me," he said of his work.

Toffoli is a member of the editorial boards of *Complex Systems*, the *Journal of Cellular Automata*, and the *International Journal of Unconventional Computing*.

His current research interests include fundamental connections between physics and computation; fine-grained modeling of physics-like systems technology (cellular automata machines) and methodology (programmable matter); and personal knowledge structuring.

Mazumder's research focuses on material engineering; solar energy systems; particle technology; and electrostatic engineering. He earned his PhD from the University of Arkansas, is co-editor-in-chief of *Particulate Science and Technology*, and received the R&D Award and the Electrostatic Society of America Lifetime Achievement Award. As a longtime IEEE member, he was also excited about the honor.

"IEEE is the world's largest technical professional association, and the diversity of its members is able to foster close connections and collaborations with colleagues in specific areas of research and scientific inquiry," he said. "To become an IEEE Fellow is a fulfilling distinction and I feel honored to be recognized by my peers."

Tomasso Toffoli

Mazumder added that he is excited to represent Boston University and become a Fellow of a group that has had historical ties to prestigious scientists such as Alexander Graham Bell and Thomas Edison. As part of his commitment, he hopes to continue to encourage students to become members of the professional society.

"Student engagement in meetings, presentations, and publications establishes a lifelong collaborative academic network of colleagues," said Mazumder. "I hope to guide ECE students to join IEEE to foster such opportunities."

Since 1963, the grade of Fellow has recognized individuals who have had an extraordinary record of accomplishments in IEEE fields of interest. The total number of IEEE Senior Members selected to be elevated to Fellow in any one year does not exceed one-tenth percent of the total voting Institute membership.

-Rachel Harrington

Big Year for Altug

Associate Professor Hatice Altug (ECE, SE) has had an incredible year. Not only was she named to the Popular Science "Brilliant 10" list, she was also presented the Presidential Early Career Award and Optical Society Medal.

Altug was given the *Popular Science* "Brilliant 10" title for being among the nation's top 10 young scientists and engineers. She is included in the magazine's list of researchers under 40 who made transformational contributions to their fields during 2010.

Popular Science editors chose the "Brilliant 10" after seeking input from professional organizations and experts in the nominees' respective fields, as well as peers and colleagues. Among their criteria were discoveries and developments that "totally uprooted their fields" and changed how researchers, doctors or engineers go about their work.

Altug was recognized for the revolutionary, highly portable, extremely low-cost biosensor she developed last year. It can quickly and reliably identify dangerous viruses such as Ebola and Marburg in resource-limited settings, and has profound implications for identifying and containing pandemics in developing countries, and for assessing potential terrorist threats in places like airports around the world.

President Obama also named Altug among the recipients of the Presidential Early Career Award for Scientists and Engineers, the highest honor bestowed by the U.S. government on science and engineering professionals in the early stages of their independent research careers. Selected for their pursuit of innovative research at the frontiers of science and technology and their commitment to community service, award recipients received a research grant lasting up to five years and an invitation to attend a White House ceremony with the president in October 2011.

In concert with the Office of Science and Technology Policy, 16 federal departments and agencies join together annually to nominate the most meritorious scientists and engineers whose early accomplishments show the greatest promise for assuring U.S. preeminence in science and engineering, and contributing to the awarding agencies' missions. One of 94 researchers to receive the prestigious award, Altug was recognized "for advancing the frontiers of proteomics to enable the discovery of protein bio-markers for detection of disease, drugs and environmental monitoring, and for innovative educational and outreach activities that have helped students at all levels."

Altug is one of a select group of Boston University faculty members to receive the PECASE award since its inception in 1996. Other recipients include Associate Professor Venkatesh Saligrama (ECE, SE) in 2004, and former Assistant Professors Paul Barber (Biology) in 2005 and Joan Walker (Geography & Environment) in 2007.

"This is an enormous achievement," said Professor Selim Ünlü (ECE, MSE), associate dean for Research and Graduate Programs. "Hatice is highly deserving of this recognition. Her work is unique in the way she was able to take cutting-edge, transformative scientific principles and apply her engineering skills in technology development and translate her innovations to solving real-life problems."

The Optical Society of America (OSA) then selected Altug as the 2012 recipient of its Adolph Lomb Medal. Established in 1940, the award is presented to early career researchers who have made a significant contribution to the field of optics.

Through the Lomb Medal, the OSA recognizes Altug for "breakthrough contributions on integrated optical nano-biosensor and nanospectroscopy technologies based on nanoplasmonics, nanofluidics and novel nanofabrication." She received a silver medal, certificate and $3,000 honorarium at an OSA conference.

"It is a great honor to receive this recognition," said Altug. "The awards will enable me to tackle new challenges and open up new research directions in the field. Together with my students, I am looking forward to making significant progress both in research and education. I would like to acknowledge the hard work of my graduate students and valuable support from my mentors."

Hatice Altug

A College of Engineering faculty member since 2007, Altug's research involves confining and manipulating light at the nanoscale to dramatically improve biosensing capabilities. Initiating several advances in the fields of nanophotonics, nanoplasmonics and integrated nanofluidics over the past eight years, she has developed state-of-the-art technologies for real-time, label-free and high-throughput detection of very low quantities of biological molecules such as proteins and viruses. She has also contributed to the National Science Foundation Smart Lighting Engineering Research Center's effort to build energy-efficient lighting-based communication and biochemical sensing systems in rooms.

-Michael G Seele, Mark Dwortzan and Caleb Daniloff contributed to this story

Karl Named Editor-in-Chief of *IEEE Transactions on Image Processing*

Professor W. Clem Karl (ECE, BME, SE) has been elected editor-in-chief of *IEEE Transactions on Image Processing*, the leading journal of image and video processing research.

W. Clem Karl

"With image processing playing such a big role in the world, it's an exciting time to be editor-in-chief," said Karl, who previously served as associate editor of the publication.

Karl is an active member of the Institute of Electrical and Electronics Engineers (IEEE), a professional association for electrical engineers that boasts more than 400,000 members in 160 countries.

"I believe in giving back to the professional community and am looking forward to interacting with my colleagues and learning new things," said Karl of his new position, a three-year appointment that begins in January 2013.

In addition to his latest role, Karl is also a member of the Board of Governors of the IEEE Signal Processing Society, member of the IEEE Biomedical Signal and Image Processing Technical Committee, and member of the Steering Committee for *IEEE Transactions on Medical Imaging*.

Karl's research at Boston University has focused on statistical signal processing; inverse problems; biomedical signal and image processing; multidimensional signal and image processing; and synthetic aperture radar. In 2000, he was awarded the department's ECE Award for Excellence in Teaching.

-Rachel Harrington

Students

Paschalidis Named 2011 Distinguished Faculty Fellow


Ioannis Paschalidis

Since joining the College of Engineering faculty in 1996, Professor Ioannis Paschalidis (ECE, SE) has developed sophisticated algorithms for everything from a homeland security early warning sensor network to a next-generation electronic healthcare management system. Based on his impressive body of work, Paschalidis was named the College's 2011 Distinguished Faculty Fellow, an award that recognizes mid-career faculty members for significant contributions to their field.

Paschalidis will receive $20,000 per year for the next five years to support his research.

"I am elated and deeply honored to receive this award," he said. "The funds will be extremely useful in seeding new directions for my research, especially in the area of medical informatics."

Co-director of the Center for Information and Systems Engineering (CISE), academic director of the College of Engineering's Sensor Network Consortium, and affiliate of the Biomolecular Engineering Research Center, Paschalidis has a diverse research portfolio that spans the fields of systems and control, networking, applied probability, optimization, operations research, computational biology and bioinformatics. His work could lead to new applications in communication and sensor networks, protein docking, logistics, cyber-security, robotics, the smart grid and finance.

Since earning his PhD degree in Electrical Engineering and Computer Science in 1996 at MIT, Paschalidis has received several honors, including a CAREER award from the National Science Foundation, an invitation to participate in the National Academy of Engineering Frontiers of Engineering Symposium, two best paper awards, best performance at a computational biology competition, and a College of Engineering Dean's Catalyst Award. He is a senior member of IEEE and an associate editor of *ACM Transactions on Sensor Networks* and *SIAM Journal on Control and Optimization*.

In receiving this year's Distinguished Faculty Fellow award, Paschalidis joins the 2010 recipient, Kamil Ekinci (ME), and the 2009 winners, Professor Mark Grinstaff (BME, MSE), Associate Professor Joyce Wong (BME, MSE) and Associate Professor Xin Zhang (ME, MSE).

-Mark Dwortzan

Team MINSensory Takes Top Prize at ECE Day '12

On May 4, the ninth floor of Boston University's Photonics Center was transformed as Electrical & Computer Engineering students displayed their end-of-the-year projects – designs that included a tracking program that follows a speaker's movements during a lecture, an iPad application designed to improve hospital efficiency, and even a ping pong ball retriever.

The projects may be challenging in scope, but that didn't stop ECE seniors from tackling the research and developing real-life solutions to engineering problems.

On ECE Day, 59 seniors had a chance to show off their senior design projects or honors theses – the result of two semesters of work.

Fifty-five of those students made up 12 teams that worked to design and prototype a product, electronic device, or software system. They worked with customers ranging from industry figures to faculty in an effort to improve everything from solar panel functionality to UAV collision avoidance.

The four remaining seniors wrote honors theses about topics ranging from geosensing to human-computer interfaces.

"The students' accomplishments surpassed even my expectations this year," said Professor Alan Pisano (ECE), the senior design advisor. "Their hard work and diligence – including several 'all-nighters' in the Senior Design Lab – really paid off in producing some of the best projects in recent years. I am very proud of this year's class."

Five alumni judges – Bradley Rufleth, Chris Maloof, David Mabius, Francine Lalooses, and David Lancia – returned to their alma mater to watch the seniors present and weigh in on their final designs. Ultimately, they selected System for Sensing Neural Response, also known as Team MINSensory, as the winner of the top prize, the P. T. Hsu Memorial Award for Outstanding Senior Design Project. Benjamin Duong, Nima Haghighi-Mood, Michael Kasparian, and Parth P. Patel (BME), members of the winning team, worked with Professor Ronald Knepper (ECE) to develop a system that senses neural responses.

"If neuroscientists are going to be using our product, we have to make something that's helpful for them," said Kasparian.

The team decided to design a complete interface suite that allows for real-time collection, analysis, and visualization of neural signals.

"A suite for collecting and visualizing this kind of data did not exist prior to this project," explained Duong.


Kholood Al Tabash (ECE '12) demonstrates her team's iMedix application to Professor Ronald Knepper.

Ultimately, the MINSensory design will provide researchers with unprecedented control and depth in their neural experiments and also help expand neural research.

The day largely focused on the seniors' accomplishments, but two teachers were awarded as well. David Castañón, ECE professor and department chair, presented Douglas Densmore with the ECE Award for Excellence in Teaching and John Gancarz was named the GTF of the Year.

Other awards announced at this year's ECE Day included:

Michael F. Ruane Award for Excellence in Senior Capstone Design
Michael Kasparian

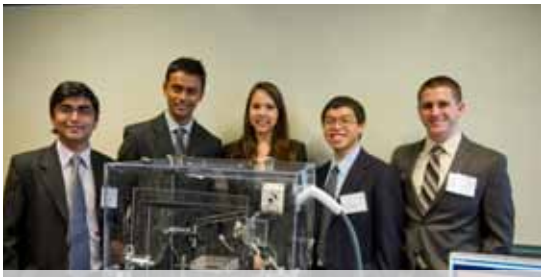
Senior Honors Thesis Award
Automated Detection of Colon Pre-Cancer Based on in vivo Endomicroscopy Images: Evgeni Aizenberg

Entrepreneurial Award
iMedix Patient-Nurse Communication System: Kholood Al Tabash, Donald Dougherty, Eric Hsiao, Kenneth Zhong, and Gregory Zoeller

Design Excellence Awards
Self-Cleaning Solar Panels: Alex Chan, Sarah Griesse-Nascimento, Kshitiz Kohli, Syed Naufal Bin Veqar and Christopher Petrik

Sailboat Bailer: Andrew Francis, Srilalitha Kumaresan, Henry Lok, Mason Tan, and Alexander Whittemore

-Rachel Harrington


Winners of one of two Design Excellence Awards pose with their self-cleaning solar panel. Pictured from left are Kshitiz Kohli; Syed Naufal Bin Veqar; Sarah Griesse-Nascimento; Alex Chan; and Christopher Petrik.

Amanda Gaudreau-Balderrama (PhD '14) Wins NIH Doctoral Fellowship

Traumatic brain injury (TBI) due to blast exposure from improvised explosive devices is the signature injury of the wars in Iraq and Afghanistan. Since 2001, the number of blast-related medical injuries to U.S. service members has been rising. The resulting patients, as well as those experiencing a TBI from sports and motor vehicle accidents, need help dealing with the long-term effects of these injuries. But first, more needs to be understood about neurotrauma.

Enter Amanda Gaudreau-Balderrama (PhD '14), a Boston University doctoral candidate in Electrical and Computer Engineering, who hopes her project will help researchers better understand the mechanisms leading to TBI. Specifically, the doctoral candidate chose to study blood-brain barrier dysfunction in blast neurotrauma using a novel technique called Metallomic Imaging Spectroscopy.

The National Institute of Health (NIH) took note of the importance of Gaudreau's research and recently awarded her with a Ruth L. Kirschstein National Research Service Award (NRSA).

The NIH NRSA is a highly competitive and prestigious award given to graduate students to support their education and training. In Gaudreau's case, the fellowship will benefit both her current research and potential career in academia by establishing her in the field.

"I am extremely honored and excited to have received this fellowship," she said. "It has allowed me to constructively lay out my dissertation research with specific aims and deliverables."

Gaudreau is the second student from Associate Professor Lee Goldstein's Boston University School of Medicine (BUSM) laboratory to receive the NIH doctoral fellowship.

Working with Goldstein, Gaudreau said she conducts "interdisciplinary translational research using analytical engineering methodology to diagnose and characterize neurodegenerative diseases."

"Once Dr. Goldstein explained more about his research efforts toward studying blood-brain barrier dysfunction, I was excited by the potential applications and extensions offered by this project," said Gaudreau.

In Goldstein's lab, students have the opportunity to look at both the biological and technical aspects of their research. Students are encouraged by Dr. Goldstein to become experts in both areas.

Gaudreau's co-advisor in ECE, Professor Janusz Konrad, will offer his expertise in image processing to further her proposed doctoral research. Konrad's technical knowledge of digital signal processing and characterization played a role in her understanding of the multidimensional MIS datasets. He also aided Gaudreau in the development of robust analytical methods which have facilitated the interpretation and understanding of the biological and medical significance of the data she collected.

Amanda Gaudreau-Balderrama (PhD '14) won the NIH Doctoral Fellowship for her research in blood-brain barrier dysfunction in blast neurotrauma.

BUSM's philosophy of conducting translational interdisciplinary research influenced Gaudreau's decision to pick her dissertation topic because it required a balance of computational and hands-on biological components. She was also eager to bring attention to the topic and have an impact on the medical community.

"I was drawn to this work not only because I would be able to expand my expertise in both image processing and neuropathology but also because I would be doing research that could have major implications on the way the medical community understands and treats traumatic brain injury," she explained.

Ultimately, Gaudreau is interested in using analytical technology that assists in characterization, detection, and treatment as she works toward the eventual goal of exploring the efficacy of therapeutic nanoparticles to treat people affected by TBI and its long-lasting aftermath.

-Sneha Dasgupta (COM '13)

Schuyler Eldridge Awarded a NASA Fellowship

So many kids grow up learning about space and wanting to work for NASA, but for Schuyler Eldridge (ECE '09, PhD '15), that dream is now a reality.

He was recently granted a NASA Space Technology Research Fellowship for his work on the project, "Biologically-Inspired Hardware for Land/Aerial Robots," which aims to design a new type of computer that can sense, learn, and adapt – just like a living brain.

This fellowship, renewable for up to 3 years, provides $70,000 per year for tuition, a stipend, and compensation for other expenses. It also allows Eldridge a chance to work with a NASA mentor remotely and at multiple NASA locations over the next few years.

Eldridge works in the Integrated Circuits & Systems group and the Neuromorphics Lab where he conducts research focusing on what he describes as "leveraging the efficiency and faulty tolerance of the brain to design hardware that solves difficult engineering problems in the areas of robotics and VLSI."

Schuyler Eldridge (ECE '09, PhD '15) has received a NASA Space Technology Research Fellowship.

"Receiving this fellowship gives me a sense of security and direction for the rest of my program of study and more importantly, gives me a sense of pride as I know this reflects favorably on the ECE department, the Neuromorphics Lab, and Boston University as a whole," said Eldridge.

Eldridge uses biological models to design hardware for enhancing the ability of autonomous robots to process sensor data, specifically visual data, and learn obstacle avoidance techniques as they navigate unknown environments. He also investigates the use of biological networks to improve the faulty tolerance of CMOS devices and works closely with his advisor, Assistant Professor Ajay Joshi (ECE).

"Schuyler is a highly motivated, hard-working, and well-organized individual. He is not afraid to work across multiple disciplines and is always willing to help others," said Joshi.

Joshi said that Eldridge has found a nice balance in his work at Boston University, where the PhD candidate mixes engineering and neuroscience into his studies.

"We hope this fellowship will allow him to work closely with NASA on their next mission and really give him a chance to make an impact," said Joshi.

While Eldridge knows his goals are very large, he's planning on working diligently to accomplish even more than he already has.

He added: "I would like to see the biological hardware that I design wind up in the next interplanetary rover or help solve reliability issues associated with CMOS scaling."

-Samantha Gordon (COM '12) and Rachel Harrington

Four ECE Students Win at BU's Science & Engineering Research Symposium

In March, four graduate students from the Department of Electrical & Computer Engineering (ECE) were chosen as winners at Boston University's Science & Engineering Research Symposium.

Each year, Science & Engineering Day gives graduate students a chance to display their research at the university-wide event. The best presentations are honored and matching awards go to the recipients' respective laboratories.

Science & Engineering Day allows graduate students to display their research at the university level.

Science & Engineering Day is open to all graduate students currently engaged in scientific research in a degree-granting program at Boston University.

Winners from the ECE Department included:

College of Engineering Dean's Award
Student: Alp Artar
Project: Multispectral Fano Resonances in Hybridized Metamaterials
Advisor: Hatice Altug

Center for Information and Systems Engineering Award
Student: Yushan Chen
Project: LTL Robot Motion Control Based on Automata Learning of Environmental Dynamics
Advisor: Calin Belta

Center for Nanoscience and Nanobiotechnology Award
Student: Arif Cetin
Project: Plasmon Induced Transparency with Asymmetric Ï€-Shaped Metamaterials
Advisor: Hatice Altug

CELEST/CompNet Computational Neuroscience Award
Student: Schuyler Eldridge
Project: Biologically-Inspired Hardware for Autonomous Robots
Advisor: Ajay Joshi

-Rachel Harrington

Alumni

BU Startup, Bytelight, Recognized for Clean Energy Potential
Aaron Ganick (ECE '10) and Dan Ryan (ECE '10)

Bytelight, a company founded by Boston University students, Aaron Ganick (ECE '10) and Dan Ryan (ECE '10), recently received $10,000 in funding from U-Launch, a United States Department of Energy-funded grant program that awards promising clean energy startups.

Spun off from the NSF Smart Lighting Engineering Research Center (ERC) and supported by BU's Photonics Center, Bytelight designs intelligent light systems that are capable of supporting digital data communications and indoor navigation through general purpose lighting. With the additional funding from U-Launch, Ganick and Ryan will continue to develop Bytelight as they explore business opportunities for visible light communication.

As undergraduates, Ganick and Ryan knew they wanted to be engineers but didn't necessarily know what direction they wanted to take in their careers. Then, they discovered an opportunity to engage in Smart Lighting research at Boston University. "We thought the idea of sending information through lighting was fascinating, and we've been working on that research ever since," said Ganick.

When Ganick began his master's program in Electrical Engineering at BU last year, he wanted to take his engineering education one step further by creating his own company. In the past, many of Boston University's engineering alumni possessed the skillset to come up with a new technology but didn't necessarily have the entrepreneurial background to turn it into a profitable business. Then, a new School of Management (SMG) course, The Business of Technology Innovation, was introduced to the curriculum, and Ganick and Ryan were among the first students to take it.

"There's been a recent push at BU to encourage engineers to learn more about the business opportunities available to them," said Ganick. "Gaining a background in business has been an asset to us, and it's great to see engineers at SMG."

Led by Paul Levine (SMG), the class was designed for engineers in order to create a deeper understanding of the business challenges associated with bringing technological innovations to the marketplace.

"My goal is to grow appreciation and change perspective," said Levine. "I'm trying to give these engineers the insight to be active contributors to the decision-making process for both the technology and business decisions their companies will face – whether those companies are well-established large businesses or 'in the garage' startups."

If Levine has been a mentor to Ganick and Ryan on the business side, Professor Thomas Little (ECE) is their guide in engineering.

"He has been an excellent mentor throughout the entire process," said Ryan. In agreement, Ganick added, "He doesn't reveal the whole picture but gives us enough information to learn by discovery."

Little said that Bytelight is both representative of the "transformative impact" intended by the National Science Foundation ERC concept and a wonderful example of the entrepreneurial network at BU, which, in addition to the School of Management and the College of Engineering, includes diverse groups like the NSF Smart Lighting ERC, the Photonics Center Incubator, the Office of Technology Development (OTD), the Kindle Mentoring Program, and the Institute for Technology Entrepreneurship and Commercialization (ITEC).

"Aaron and Dan have done a great job of immersing themselves in the entrepreneurial network at BU," said Little. "Through this networking, Bytelight has gained access to many, many avenues for jumpstarting a new business."

Previously, Bytelight was accepted into the Summer@Highland program. The startup currently operates out of Dogpatch Labs in Cambridge.

- Rachel Harrington

Erhan Ermis (MS '05, PhD '10): Consulting and 'Making Sense of the Pieces'

Usually, earning graduate degrees in electrical engineering will prepare a student for a variety of fields including communications, health care, transportation, and security. But when Erhan Ermis (MS '05, PhD '10) graduated from Boston University, he decided to take a different route.

Ermis works in his home country, Turkey, as a consultant for The Boston Consulting Group. He may not apply the full depth of his engineering know-how on a daily basis but said that the skills he sharpened in the Electrical & Computer Engineering Department (ECE) prepared him for his career today.

"My work involves breaking down problems, making sense of the pieces, and putting solutions back together, which I did a lot of while at the ECE Department," said Ermis.

As part of his work, Ermis works with a number of industries, including financial and pharmaceutical, and advises them on the best way to run their business. Depending on the project, he might focus on developing a growth strategy for a client or optimizing their business portfolio, and then switch gears and work on cost-efficiency for another client.

"It's a great job because you're not boxed into a specific area unless you prefer to be, and you gain a lot of exposure to different industries and business functions," said Ermis.

Ermis's advisor, Professor Venkatesh Saligrama (ECE), said that his student was always interested in leveraging his engineering background in a business environment. While at BU, Ermis was instrumental in founding the Entrepreneurship & Design Contest and built momentum for the program through the Student Association of Graduate Engineers (SAGE), of which he was the president before leaving BU.

"While he did excellent research work during his PhD and had post-doctoral offers, he viewed himself as someone who could not only work on hard research problems but also could help manage and analyze problems at the interface of engineering and management," Saligrama said.

Talking about his time at BU, Ermis expressed a specific appreciation for the open door policy of Information Sciences and Systems professors like Saligrama, who encouraged both his research pursuits – statistical signal processing and sensor networks – and interests outside of academic work.

"Professor Saligrama was always accessible and excited about our research," said Ermis. "He would give you energy if you didn't have any – and I mean that in a positive way. You won't find many professors like that."

Ermis spent some of his summers away from the classroom to test out careers in finance and

Erhan Ermis (MS '05, PhD '10)

business. "It helped me experiment with my interests a couple of years before graduation, and once I chose my direction, I had enough time to prepare for what I wanted to do next," said Ermis.

For ECE students considering a career in consulting, Ermis suggested developing soft skills to complement their analytical skills.

"Top consultancies look for top talent and find that in many dimensions. The best candidates are all well-rounded people," Ermis said. "It's imperative to do well on your research and academics, but that alone is never enough. You must have strong leadership and communication skills, and you need to start developing them as early as possible – if you don't already possess them, of course."

-Rachel Harrington

Elizabeth Begin (MS '08): Improving Healthcare One Algorithm at a Time

For months at a time, you might find Elizabeth Begin (MS '08), an image-processing engineer at the Volcano Corporation, working toward developing a new algorithm that can be used in one of the company's medical devices. It can be challenging work, but in the long run, she may play a big role in saving lives.

"It's a great feeling to see an algorithm that you've spent months developing work on a real system and know that algorithm may someday help physicians and patients all over the world," she said.

Begin's main focus at Volcano is to develop signal and image processing algorithms to improve the

Elizabeth Begin (MS '08)

experience of the physicians with their Optical Coherence Tomography (OCT) system, currently under development. OCT has been used in ophthalmology and most recently through catheters for intravascular imaging. She develops algorithms to speed up acquisition and improve image quality, user interaction, and image interpretability on this new system.

Begin's current line of work is a complete 180-degree change from her first job. She began at Raytheon, a major defense contractor, as a systems engineer. Though she had a great experience there, her interest in the medical devices industry was too strong to ignore.

"I was concerned if I went much further in my career working in defense that it would become more difficult to make the transition," Begin said.

Even as a graduate student, Professor Janusz Konrad (ECE), Begin's advisor, said that it was clear early on that she wanted to work in healthcare.

"She always wanted to work in the medical field and help people, though she knew she would join Raytheon immediately upon graduation," Konrad recalled.

At Boston University, Begin was both persistent and a hard worker.

"Liz quickly realized that research is actually re- and search," said Konrad. "Her super-resolution project was very challenging. Even if she was happy with an improvement in her results, she knew she had to keep going. She never was discouraged. To the contrary, she always smiled."

Begin said that her experience at BU was extremely positive. "One of the most enjoyable parts of my experience was getting to know my professors and classmates," she said. "It was great to collaborate with my classmates on projects and really get to know them after many long hours working in the computer lab. We each had our own strengths from our different backgrounds and were able to learn from one another."

Because of her success, ECE students may be able to learn from Begin's experience.

"Don't be afraid to leave your comfort zone, and don't forget to celebrate your achievements," she said.

-Samantha Gordon (COM '12)

Karen Panetta (EE '85): Mentoring Excellence

When she graduated from Boston University over 25 years ago, Karen Panetta (EE '85) saw two obstacles blocking young women from pursuing and completing undergraduate studies in engineering: a dearth of role models and an abundance of negative media portrayals of engineers as socially inept eggheads. So within a few years of joining the ECE faculty at Tufts University, Panetta formed "Nerd Girls," an innovative program in which teams of female and minority engineering students build their confidence while developing solutions to critical societal challenges, and share their experiences with K-12 girls. Since its inception in 1999, Panetta has personally mentored more than 140 Nerd Girls, 90 percent of whom have gone on to pursue a graduate degree in engineering.

Leveraging her success with Nerd Girls, Panetta has conducted outreach and mentoring activities for more than 30,000 students and educators across the globe to help youth realize their potential to positively affect the world. And now her impact on the next generation of engineers has drawn attention from the highest office in the land: Panetta was named as one of eight recipients of the 2010 Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring.

Issued to outstanding individuals and organizations at a White House ceremony on December 13, the award recognizes the crucial role that mentoring plays in the academic and personal development of students studying science and engineering from elementary to graduate school – particularly those who belong to groups that are underrepresented in these fields. Each recipient receives $25,000 from the National Science Foundation to advance their mentoring efforts.

Karen Panetta (EE '85) (front center) with students at a Nerd Girls outreach event in a Microsoft Corp. facility in North Carolina.

"This award brings national recognition to the work we've done in dispelling the negative, one-dimensional stereotypes of smart women and enabling a more inclusive environment for women and minorities in science and technology," said Panetta.

Toward that end, she plans to use her award money to help conduct more Nerd Girl outreach events to inner city schools and support more community-based Nerd Girl engineering projects, from designing solar energy systems for a lighthouse to a wireless remote monitoring system.

Panetta was selected for the award based on stellar nominating letters from students, colleagues and administrators, including Evelyn Hirt, IEEE USA President.

"Karen has been recognized for over a decade as our country's leading expert in innovating successful low-cost methods for disseminating engineering and science to youth, parents, educators and the general public to help recruit young women to the STEM disciplines," said Hirt.

Since graduating from BU, Panetta, now an IEEE Fellow, has supported women in engineering in several prominent positions within IEEE, including Women in Engineering (WIE) Worldwide Director, WIE Committee Chair and WIE Magazine Editor-in-Chief. She has also mentored women engineering students as advisor to the Tufts University chapters of IEEE and the Society of Women Engineers (SWE), and served as keynote speaker for an SWE regional conference hosted at BU in 2010. She received the 2006 BU Outstanding Alumni Award and now serves on the BU Engineering Alumni Board.

President Barack Obama greets the 2010 Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring Recipients in the Oval Office on December 12, 2011. Panetta is fifth from the left. (Official White House photo by Pete Souza)

According to the National Center for Education Statistics, women received 13.5 percent of all undergraduate degrees awarded in engineering in 1985 when Panetta earned her bachelor's degree in electrical engineering, and 16.5 percent in 2009. This slight improvement over a quarter century indicates that the need for mentoring programs for women in engineering remains strong.

"When I was a student, there were almost no women in the College of Engineering, and I wanted camaraderie – to build confidence that I wasn't alone in the isolation I sometimes felt as a woman in engineering," said Panetta, the first female electrical engineer given tenure in Tufts' ECE Department. "Mentorship has been the most enjoyable part of my job, and it's why I became a professor."

- Mark Dwortzan

Programming

ECE Department Debuts MEng Degree

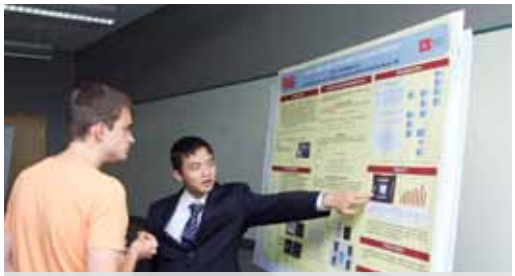
In Fall 2011, the College of Engineering began offering six new Master of Engineering (MEng) degrees in computer, electrical, manufacturing and mechanical engineering; materials science and engineering; and photonics – in addition to the two degrees already available in biomedical and systems engineering.

Each of these eight MEng programs is designed for those seeking careers in industry. Unlike the research-focused Master of Science and PhD programs, the MEng does not require a thesis and can be completed in just one year of full-time study. Some of the MEng programs also allow students to do a project within a course structure.

In the Department of Electrical & Computer Engineering, nine students who made up the first ECE MEng class earned their degrees in May. The breakdown by degree was four in electrical engineering, three in computer engineering, and two in photonics. The program will continue to grow in Fall 2012 when the Department welcomes 38 more MEng students.

The new MEng programs will help address a need for engineering managers with advanced technical knowledge and communication skills which was projected by the U.S. Bureau of Labor Statistics (BLS). Coursework in the MEng programs includes an emphasis on technology leadership skills and management in the global workplace, as well as advanced technical training.

The BLS also notes that those with master's degrees earn an average of $400,000 more over the course of their careers than those with just a bachelor's degree.



Graduate students, shown here at an MS Poster Symposium, now have two different programs to choose from when pursuing their master's degrees.

PhD Dissertations

Student Name	Dissertation Advisor	Dissertation Title
Nuno Almeida	Enrico Bellotti	Nano-Structure Multi-Physics Device Simulator
Sonal Ambwani	W. Clem Karl	Joint Cardiac and Respiratory Motion Correction and Super-Resolution in Cardiac PET/CT
Suraj Bramhavar	Kamil Ekinci	Frequency Domain Laser Ultrasonics: Optical Transduction of Acoustic Waves and Nanomechanical Devices
Bryan Cole	Hamid Nawab	Integrated Processing and Understanding of Wearable Sensor Signals
Roman Egorov	Alexander Sergienko	High Resolution Measurement of Telecommunication Component PMD by Means of Quantum Interferometry
Kai Guo	Janusz Konrad Prakash Ishwar	Action Recognition on Covariance Manifolds
David Harrah	Anna Swan	Non-Radiative Exciton Decay in Single-Walled Carbon Nanotubes
John Henson	Roberto Paiella	Plasmonic Enhancement Engineering for Semiconductor Light Emitters
Brian Hicks	Supriya Chakrabarti	Nulling Interferometers for Space-Based High-Contrast Visible Imaging and Measurement of Exoplanetary Environments
Md. Khan	Martin Herbordt	Scalable Molecular Dynamics Simulation Using FPGAs and Multicore Processors
Chen-Kai Kao	Theodore Moustakas	Development of Ultraviolet Electroabsorption Modulators and Light Emitting Diodes Based on AlGaN Alloys
Craig Keasler	Enrico Bellotti	Advanced Numerical Modeling and Characterization of Infared Focal Plane Arrays
Yingwei Lin	Ioannis Paschalidis	Optimized Dynamic Vehicle Routing Policies with Applications
Alyssa Pasquale	Luca Dal Negro	Engineering Photonic-Plasmonic Devices for Spectroscopy and Sensing Applications
Burkay Orten	W. Clem Karl Prakash Ishwar	Use of Sensing Structure in High-Dimensional Decision Making Motivated by Computed Tomography Perfusion Imaging
Ivana Stojanovic	W. Clem Karl	Sparse Reconstruction of Target Attributes in Monostatic and Multistatic SAR
Vyas Venkataraman	Martin Herbordt	Lyra: A High Level Modeling and Synthesis Methodology for Concurrent Systems Using Rendezvous

Additional PhD Dissertations with ECE Advisors

Student Name	Dissertation Advisor	Dissertation Title
Ali Kebarighotbi (SE)	Christos Cassandras	Perturbation Analysis in Fluid Scheduling and Optimization of Stochastic Hybrid Systems
Ronald Taylor Locke (SE)	Ioannis Paschalidis	Anomaly Detection with Applications in Environmental and Cyber Security
Philipp Spuhler (BME)	M. Selim Unlu	High-Throughput Detection of DNA Orientation and Conformation of Protein-DNA Interactions
Zeyu Wu (SE)	Thomas Little	Free Space Optical Networking with Visible Light: A Multi-Hop Multi-Access Solution

Our graduate students work in research groups like the Optical Characterization and Nanophotonics Laboratory (pictured).

Faculty

Professors

Irving Bigio

David Bishop
Head of the Division of Materials Science and Engineering

Richard Brower

Robert Brown
President

Christos Cassandras
Head of the Division of Systems Engineering

David Castañón
Department Chair

Mark Horenstein

Allyn Hubbard

Roscoe Giles

W. Clem Karl

Mark Karpovsky

Ronald Knepper

Janusz Konrad

Min-Chang Lee

Lev Levitin
Distinguished Professor

Thomas Little
Undergraduate Studies Associate Chair, NSF Smart Lighting ERC Director

Theodore Morse

Theodore Moustakas

Hamid Nawab
Graduate Studies Associate Chair

Ioannis Paschalidis

Venkatesh Saligrama

Alexander Sergienko

Allen Tannenbaum
Visiting Professor

Selim Ünlü
Associate Dean for Research and Graduate Programs

Associate Professors


Murat Alanyali


Hatice Altug


Enrico Bellotti


Jeffrey Carruthers


Luca Dal Negro


Martin Herbordt


Prakash Ishwar


Robert Kotiuga


Roberto Paiella


Alan Pisano
Associate Professor of the Practice


Siddharth Ramachandran


Joshua Semeter


David Starobinski


Anna Swan


Ari Trachtenberg
Graduate Studies Associate Chair

Assistant Professors


Ayse Coskun


Douglas Densmore


Ajay Joshi


Bobak Nazer

Affiliated Faculty

John Bailleul
Professor, Mechanical Engineering

Supriya Chakrabarti
Professor, Astronomy

Carlo De Luca
Professor, NeuroMuscular Research Center

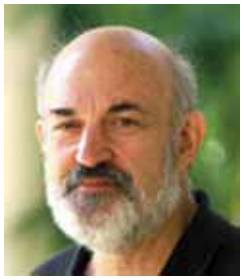
Solomon Eisenberg
Professor and Chair, BME; Joint Faculty Member (BME, ECE)

Farouk El-Baz
Director, Center for Remote Sensing

Theodore Fritz
Professor, Astronomy

Bennett Goldberg
Professor and Chair, Physics; Professor, Biomedical Engineering

Lee Goldstein
Associate Professor, Biomedical Engineering



William Klein
Professor, Physics; Joint Faculty Member (ECE, Physics)

Michael Mendillo
Professor, Astronomy

Jerome Mertz
Professor, Biomedical Engineering

Eric Schwartz
Professor, Neurobiology and Anatomy; Joint Faculty Member (ECE, BUSM)

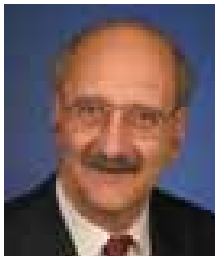
William Skocpol
Professor, Physics

Research Faculty

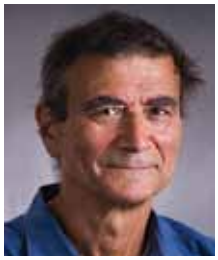
Carlos Lopez
Research Assistant Professor

Malay Mazumder
Research Professor

William Oliver
Research Associate Professor



Dimitris Pavlidis
Research Professor



Tommaso Toffoli
Research Professor

Daniel Tsui
Research Professor

Emeritus Faculty

John Brackett

Thomas Kincaid

David Perreault

Michael Ruane

Bahaa E. A. Saleh

Malvin Teich

Richard Vidale

Adjunct Faculty

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Babak Kia Montazam
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Vladimir Kleptsyn
Senior Lecturer

Thomas Skinner
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Tom VanCourt
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