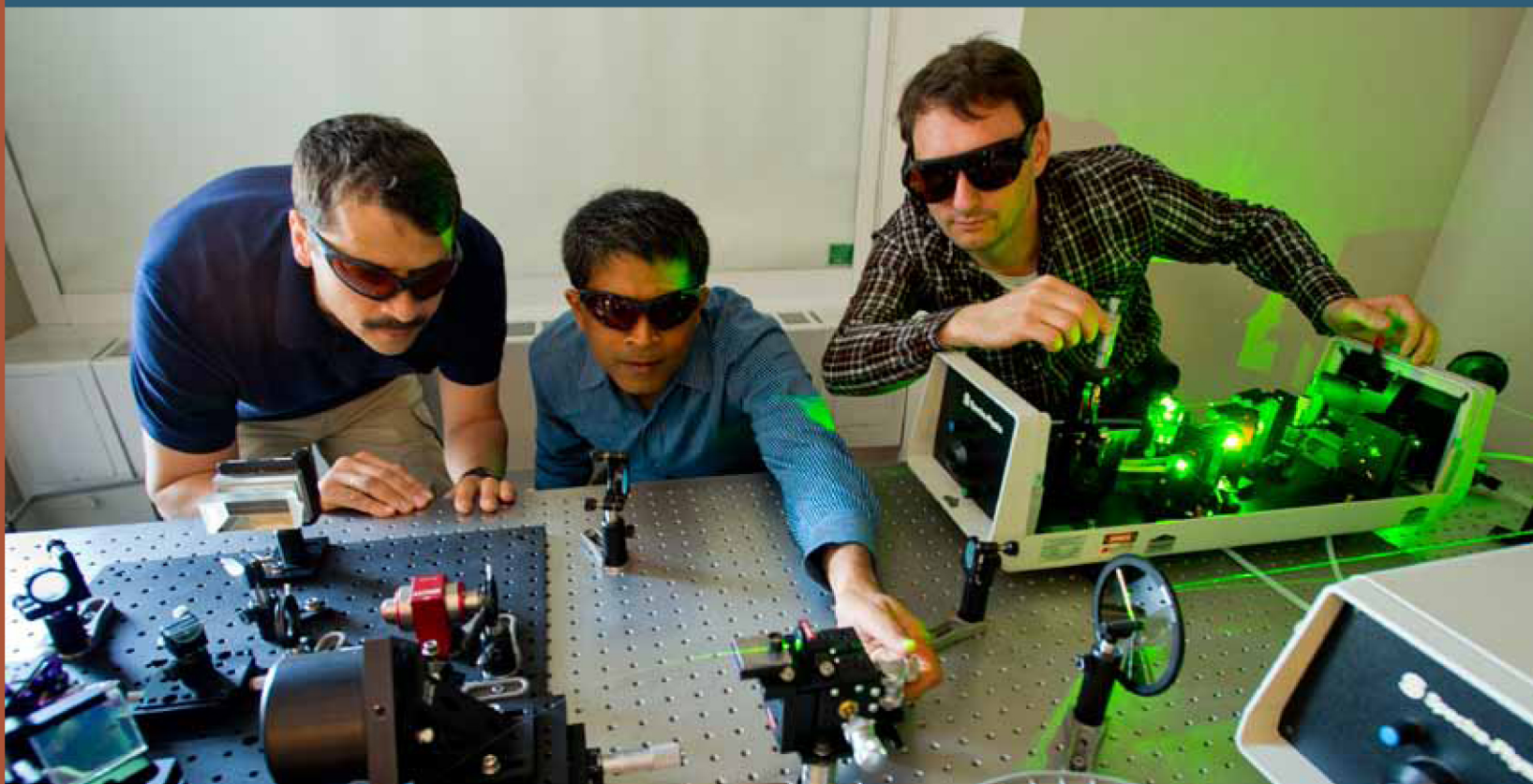


Boston University College of Engineering
Department of Electrical & Computer Engineering

Annual Report 2010 - 2011



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Department of Electrical & Computer Engineering

Boston University
Department of Electrical & Computer Engineering

Annual Report 2010–2011

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Production: Rachel Harrington
Content: Rachel Harrington, ECE staff, and ECE faculty

Cover: Top photo- Team members of The Shipless Skippers, Nathaniel Wilkie, Abigail Bonnice, and Joseph Beckenbach (pictured from left), show their research during ECE Day '11. Bottom photo - Associate Professor Siddharth Ramachandran works in a photonics laboratory with Roman Barankov (left) and Dr. Damian N. Schimpf.

This report provides a description of the instructional and research activities of the Department of Electrical & Computer Engineering at Boston University during the 2010–2011 academic year. Instructional activities are reported from the Fall 2010 through Summer 2011 semesters while scholarly activities and budget information are reported from July 1, 2010 to June 30, 2011.

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.

Message From the Chair



This was another successful year for Boston University's ECE Department - a year that saw many changes while the Department maintained its focus on steady improvement for its research and education missions. The year began with the addition of promising young tenure-track faculty, Bobak Nazer and Doug Densmore, who have

added depth and breadth to our expertise in Information Sciences and Systems and Computer Engineering, respectively. We also added our first Professor of the Practice, Alan Pisano, who joined us after many years at General Electric. Midway through the year, our colleague David Campbell retired as Boston University's provost to rejoin the physics faculty. We also bid farewell to two of our colleagues, Tom Skinner and Mike Ruane, who retired but will continue to participate in the Department in reduced roles.

In our undergraduate programs, we introduced several exciting changes in our curriculum, through our ongoing effort to increase the flexibility of our programs while providing a rigorous foundation of relevant engineering science. We created a new freshman course on Engineering Computation that is available to all majors and introduces students to various aspects of

computing, from programming languages to scripting languages and embedded computing. We also added a freshman course on Electronic Control of Robots as part of our Introduction to Engineering series within the College of Engineering. For more advanced students, we introduced two new courses, Electric Energy Systems: Adapting to Renewable Resources and Sensors in Space, that leverage renewed interest in electric energy systems and our collaborations with Space Physics researchers. We added a new course in Cybersecurity, accessible to both undergraduates and graduates, and revised the content of our capstone senior design course to exploit the added industrial experience of Professor Pisano. Under the leadership of Mark Horenstein, we continued our outreach program to increase the visibility of ECE within our prospective applicants and Boston University and held a very successful ECE undergraduate research and laboratory job fair.

Our faculty had another excellent year in acquiring research funding and earned new grants totaling approximately \$11.7 M in addition to a sizeable pool of continuing grants. Our faculty also received major recognition for their excellence in research. Ted Moustakas received the College of Engineering's Distinguished Scholar Award and the Molecular Beam Epitaxy Innovator Award. Hatice Altug was named a future recipient of the Popular Science Magazine Brilliant 10 Award and received the IEEE Photonics Society Young Investigator Award and the Boston University College of Engineering's Early Career Research Excellence Award. Irving Bigio and Mal Teich were elected as fellows

of SPIE. Christos Cassandras was chosen as winner of the 2011 IEEE Control Systems Technology Award in recognition of his design and commercial development of SimEvents, a discrete event and hybrid system simulator he developed with Michael Clune from Mathworks. This award will be presented in December 2011. In terms of professional service, Clem Karl was elected to the Board of Governors of the IEEE Signal Processing Society, and Christos Cassandras was elected President of the IEEE Control Systems Society.

Our graduate programs received increased attention and saw over 1000 applicants as well as significant interest in our new Masters of Engineering (MEng) program. Our incoming class of 80 MS and MEng students and 22 new PhD students will add support to our research mission. Our graduate students received six best student paper awards and one of our graduate student teams, RayVio, finished first in the Institute for Technology Entrepreneurship and Commercialization (ITEC) 11th Annual \$50K New Venture Competition.

As mentioned earlier, we integrated three new faculty members into the department: Doug Densmore, Bobak Nazer and Alan Pisano. We also continued our aggressive recruitment and added three senior faculty: David Bishop, former Chief Technology Officer of LGS Bell Labs Innovations at Alcatel Lucent; Allen Tannenbaum, previously a Professor at Georgia Tech who joined the Department this fall; and Daniel Tsui, former Professor, now Professor Emeritus at Princeton. Bishop will lead the Materials Science Division in the College of Engineering and will

add strength to our materials science effort through his research in low temperature physics and superconductivity. Tannenbaum is a world leader in computer vision, biomedical imaging and robust control. His research efforts will overlap with Biomedical Engineering and the Boston University Medical Campus and will add new research and teaching dimensions in our Information Sciences and Systems group. Tsui, a Nobel Prize winner in physics, will collaborate with our researchers in photonics and materials science.

In conclusion, this year the ECE Department was successful in maintaining its traditional strengths in research and education while also improving upon undergraduate outreach, enhancing the curriculum, and recruiting some excellent senior faculty. I look forward to seeing our Department's continued growth and working with our faculty, students, and staff to build on our momentum.



David Castañón
Department Chair *ad interim*
September 2011

Highlights

ECE Welcomes New Faculty Members

The Department of Electrical & Computer Engineering (ECE) was pleased to welcome two new faculty members to its ranks this year.

Assistant Professor **DOUGLAS DENSMORE** (PhD, University of California, Berkeley, 2007) came to the department after working as a Chancellor's Postdoctoral Fellow both at UC Berkeley and the Joint BioEnergy Institute. His research interests include high level languages for synthetic biology; data exchange standards for biological parts and devices; system level design of embedded systems; computer architecture; and design for test. He is currently working with a BU-led team to engineer robot-assisted, bacteria-based sensors. He also runs the Center for Integrating Design Automation Research (CIDAR), which looks at ways to integrate automation techniques into disciplines not traditionally defined by rigorous design automation methodologies.

Another UC Berkeley graduate, Assistant Professor **BOBAK NAZER** (PhD, University of California, Berkeley, 2009), also joined our department this year after working as a postdoctoral associate at the University of Wisconsin. His research areas include information theory and communications; reliable computation over networks; and distributed signal processing. This year, he was awarded a Dean's Catalyst Award from Boston University's College of Engineering. Previously, he received the Eli Jury Award for Outstanding Achievement in Systems, Communications, Control, or Signal Processing for his dissertation research.



Densmore



Nazer

Faculty Awards and Honors

HATICE ALTUG received the Boston University College of Engineering's Early Career Research Excellence Award. She was also the recipient of the Young Investigator Award given by the IEEE Photonics Society.

IRVING BIGIO and **MALVIN TEICH** were elected fellows of SPIE, the international society for optics and photonics.

CHRISTOS CASSANDRAS was named the president-elect of the IEEE Control Systems Society.

AYSE COSKUN and Jie Meng (PhD '13) received the A. Richard Newton Graduate Scholarship from the Design Automation Conference.

DOUGLAS DENSMORE was selected as a Richard and Minda Reidy Family Career Development Professor. This professorship is awarded to young faculty in the College of Engineering at Boston University.

PRAKASH ISHWAR and **JANUSZ KONRAD** received the Best Paper Prize at the 7th IEEE International Conference on Advanced Video and Signal-Based Surveillance. They also won the Aerial View Activity Classification Challenge at the 2010 Inter-

national Conference on Pattern Recognition.

AJAY JOSHI, BOBAK NAZER, ROBERTO PAIELLA, IOANNIS PASCHALIDIS and **ANNA SWAN** received Dean's Catalyst Awards from Boston University. These prizes encourage early-stage, innovative, interdisciplinary projects that could spark new advances in a variety of engineering fields.

W. CLEM KARL was elected to the IEEE Signal Processing Society Board of Governors.

JANUSZ KONRAD was named Boston University's ECE Professor of the Year at ECE Day 2011.

THEODORE MOUSTAKAS received the Molecular Beam Epitaxy (MBE) Innovator Award and the Boston University College of Engineering's Distinguished Scholar Award.

SIDDHARTH RAMACHANDRAN was appointed the chair for the Optical Society of America (OSA) committee for the annual Nick Holonyak Jr. Award.

DAVID STAROBINSKI'S research was chosen as a Top Cited Article 2005-2010 by the journal of Ad Hoc Networks (Elsevier).

SELIM ÜNLÜ was named the editor-in-chief of the IEEE Journal of Quantum Electronics.

Promotions and Tenure

PRAKASH ISHWAR was promoted to the rank of Associate Professor with tenure.

Departing Faculty

Professors **MICHAEL RUANE** and **THOMAS SKINNER**, who had worked more than 50 years combined in the Electrical & Computer Engineering Department, retired this year.

Throughout his time at Boston University, Ruane was known for his dedication toward students. He was responsible for organizing the Senior Design Project and ECE Day, one of the department's most recognized events. He was also the inaugural faculty director of outreach for the College of Engineering. He received the College's Faculty Service Award in 1991, the ECE Outstanding Teacher Award in 1999, the American Society of Engineering Education's New England Region Outstanding Professor Award in 2004, and the ECE Faculty Service Award in 2010.

Professor Skinner, whose research interests included microprocessors, computer networks, operating systems, and distributed systems, had also been awarded for his work over the years. In 2003, he received the Microsoft Most Valuable Professional Award, and in 1997, he was awarded the College of Engineering Award for Excellence in Teaching.

Professor **DAVID CAMPBELL**, upon stepping down as Provost, is no longer a member of the ECE Department and is now a full-time faculty member of the Physics Department.

Undergraduate Program

Combined enrollment in the BS programs was 204 students across the EE and CE majors. We continue to enjoy a strong record of placement of our graduating seniors in both programs. The number of EE and CE BS degrees awarded this year were 31 and 16, respectively.

Efforts to enhance the undergraduate laboratories are successfully ongoing, with new equipment, maintenance, and upgrades this year. In both classrooms and laboratories, emphasis is placed on design, laboratory practice, and applications. Successful ideas that were initiated in previous years, such as ECE Day and the ECE Professor of the Year Award, continued this year.

Undergraduate Student Awards

Students **LUKE ANDERSON**, **ANNA EVANS**, **PATRICK HENSON**, **JONATHAN KWAN**, and **ANGELO LUO** of Team GloveSense were selected by Senior Project faculty as recipients of the 2011 P. T. Hsu Memorial Award for the best overall ECE senior design project.

A Harold C. Case Scholarship, which recognizes juniors for academic excellence and service to Boston University, was given to **IDAN WARSAWSKI**.

SAMIR AHMED, **EVEGENI AIZENBERG**, and **KAM LAI** were awarded Kenneth R. Lutchen Distinguished Fellowships, designed to fund summer research projects that will have a societal impact.

Graduate Program

Five new PhD students were awarded the Dean's Fellowships (DFs) and matriculated in Fall 2010. These students will be continuing their degree programs and are making excellent progress. Seventeen new PhD students matriculated with Graduate Teaching Fellowships (GTFs) in the same period; fourteen of these students were offered Research Assistantships (RAs) for the Fall 2011 semester.

With respect to degree production, 40 and 21 students graduated with the MS and PhD degrees, respectively, during the report period. The breakdown by degree is: 43 in EE, nine in CE, eight in CSE and one in Photonics.

We experienced an excellent recruiting year for Fall 2011 admissions. After receiving more than 1000 applicants to the program, we expect an incoming class of 45 MS students, 35 MEng students and 22 PhD students. With respect to fellowships and assistantships, we will be matriculating 21 new funded graduate students for the Fall 2011 semester: three Dean's Fellows, 22 ECE Fellows, and one Photonics Fellow.

These numbers indicate a significant increase in the number of applicants, yield on fellowship offers, and the overall quality of the fall matriculants. This continues the trend of securing a class of funded students of increasing quality amidst a growing pool of candidates interested in our degree programs in ECE.

MEng

This year the department accepted applications for its new Masters of Engineering (MEng) program, available in Computer Engineering, Electrical Engineering, and Photonics. This degree program was designed for students who are primarily interested in industry careers or becoming practitioners in the field, sporting more flexibility and breadth than the Master of Science

degree. Students in this program can choose some courses in related fields outside of the college, such as entrepreneurship or project management, and they are not required to complete a thesis.

Graduate Student Awards

ECE graduate students made an impressive showing in the 2011 Science and Engineering Day hosted by the University. The College of Engineering Dean's Award was given to **JOHN HENSON**, who works under the guidance of Professor Roberto Paiella. **SONAL AMBWANI**, who works under the guidance of Professor W. Clem Karl, was the recipient of The Center for Information and Systems Engineering Award. The Photonics Center Berman Future of Light Prize was awarded to **CICEK BOZTUG**, who works under the guidance of Professor Roberto Paiella. **ROZA GHAMARI** was the recipient of The Hariri Award for Transformative Computational Science Research and works under the guidance of Professor Douglas Densmore. The President's Award was given to **NENAD BOZINOVIC** who works under the guidance of Professor Siddharth Ramachandran. The ECE Award, which is given to the graduate student with the overall best poster, was awarded to **FAISAL SUDRADJAT**, who works under the guidance of Professor Roberto Paiella

The ECE Best Dissertation Award recognizes annually the most outstanding PhD research by a student completing during the year ending in April. The award was given to Dr. **NAN MA** for his dissertation titled, "Interactive Source Coding for Function Computation in Networks." Dr. Ma's research was conducted under the guidance of Professor Prakash Ishwar and is in the Information Sciences and Systems research area.

At the 2011 Annual Meeting of the Electrostatics Society of America, **JEREMY STARK** won a first place student paper prize.

REZA MOAZZEZ ESTANJINI received Best Student Paper Honors at the 9th International Symposium on Modeling and Optimization in Mobile, Ad Hoc, and Wireless Networks (Wi-Opt).

JIE MENG and Assistant Professor Ayse Coskun were awarded the A. Richard Newton Graduate Scholarship for their research at the Design Automation Conference (DAC).

YITAO LIAO led his team, RayVio, to a first place finish in the Institute for Technology Entrepreneurship and Commercialization (ITEC) 11th Annual \$50K New Venture Competition. Other members of the team included ECE PhD student, **CHEN-KAI KAO** and Professor Theodore Moustakas.

Both **SONAL AMBWANI** and **ZACHARY SUN** received Best Poster awards at the Bernard M. Gordon Center for Subsurface Sensing and Imaging Systems Research and Industrial Collabora-

tion Conference (CenSISS).

YUSHAN CHEN was awarded the Best Student Paper award at the 10th International Symposium on Distributed Autonomous Robotic Systems.

KAI GUO and his advisors, Professors Prakash Ishwar and Janusz Konrad, won the Best Paper Prize at the 7th IEEE International Conference on Advanced Video and Signal-Based Surveillance (AVSS). They also won the Aerial View Activity Classification Challenge in the Semantic Description of Human Actions (SDHA) contest during the 2010 International Conference on Pattern Recognition (ICPR).

MICHELE MORESCO received the Best Student Paper Award at the Numerical Simulation of Optoelectronic Devices 2010 Conference (NUSOD).

ALP ARTAR was awarded the Best Student Presentation Award at the SPIE Optics + Photonics conference.

Major Grants

New research funding this year totaled approximately \$11.7M in awards for research, of which \$8.7M were awarded to ECE Principal Investigators (PI) and \$3M were awarded to ECE faculty members working as Co-PI on projects outside of the Department. Of the PI awards, 29 were for new research projects, while 29 awards were for continuing projects.

New Awards

MURAT ALANYALI (PI) received two grants from the National Science Foundation - \$345,317 for NeTS: Small: Periodic Schedules for Energy-Efficient Wireless Coexistence and \$714,501 for NetSE: Medium: Collaborative Research: Promoting Secondary Spectrum Markets via Profitability-Driven Methods and Algorithms. He will work with **DAVID STAROBINSKI** (Co-PI) on the latter.

DAVID CASTAÑÓN received \$245,000 from the Department of Homeland Security for ALERT: Awareness and Location of Explosive-Related Threats.

The Department of Defense, Air Force Office of Scientific Research (AFOSR), awarded **MIN-CHANG LEE** \$211,510 for Investigation of Ionospheric Turbulence and Whistler Wave Interactions with Space Plasmas.

THOMAS LITTLE (PI), **HATICE ALTUG** (Co-PI), and **SELIM ÜNLÜ** (Co-PI) received \$678,000 from the National Science Foundation for NSF Engineering Research Center for Smart Lighting-Administration.

The Department of Defense, Defense Advanced Research

Projects Agency (DARPA), awarded \$1,521,034 million to **THEODORE MOUSTAKAS** (PI), **LUCA DAL NEGRO** (Co-PI), and **ROBERTO PAIELLA** (Co-PI) for Sub-250 nm Electron-Beam Pumped Semiconductor Laser (SBIR).

IOANNIS PASCHALIDIS was awarded \$286,504 from the Department of Health and Human Services, NIBIB, for Refinement Methods for Protein Docking Based on Exploring Multi-Dimensional Energy Funnels.

The Department of Defense, Office of Naval Research (ONR), awarded **SIDDHARTH RAMACHANDRAN** \$470,000 for High-Power Blue-Green Lasers for Communications, and \$255,818 for Power-Scalable Blue-Green Bessel Beams. He also received \$224,784 from the Department of Defense, Defense Advanced Research Projects Agency (DARPA), for Higher Dimensional Information Encoding with Vortex Fibers.

MICHAEL RUANE (PI) and Cynthia Brossman (Co-PI) received \$274,970 from the National Science Foundation for TRIPSS - RET Site in Biophotonics Sensors and Systems.

Continuing Awards

The National Science Foundation (NSF) provided continued funding for CAREER awards presented to **HATICE ALTUG**, **LUCA DAL NEGRO**, **PRAKASH ISHWAR**, and **VENKATESH SALIGRAMA**. Altug was awarded \$399,869 for Nano-Plasmonic Resonances For Biodetection Systems; Dal Negro received \$400,000 for Combined Light And Carrier Localization In High-Refractive Index Silicon Nanocrystal Structures: A Novel Approach For Si-Based Lasers; Ishwar was awarded \$400,000 for Information-Scaling Laws, Bit-Conservation Principles, and Robust Coding Architectures In Sensor Networks; and Saligrama received \$400,000 for A Systems Approach To Networked Decision Making In Uncertain Environments.

CHRISTOS CASSANDRAS (PI), **IOANNIS PASCHALIDIS** (Co-PI), and Azer Bestavros (Co-PI) received \$1,980,349 in continued funding from the NSF for their project, EFRI-ARESCI: Event-Driven Sensing For Enterprise Reconfigurability and Optimization.

The NSF and Northeastern University continued to fund the multi-university Engineering Resource Center (ERC) CENSISS program. **DAVID CASTAÑÓN** (PI) and his team received \$5,974,606 in continued funding.

LUCA DAL NEGRO received \$435,704 in continued funding for his project, Biodegradable Communications System, from the Department of Defense/Army via Tufts University.

THOMAS LITTLE, leader of the Boston University work effort for another multi university NSF ERC, received continued funding of \$1,721,241 for the NSF Engineering Research Center for Smart

Lighting. He, **JANUSZ KONRAD** (Co-PI), and **PRAKASH ISHWAR** (Co-PI) also received \$450,000 in additional support from the NSF for their project, NETS-NOSS: Localized Computation and Network Path Formation to Enable Pervasive Video Sensing.

IOANNIS PASCHALIDIS (PI) and **CHRISTOS CASSANDRAS** (Co-PI) received \$779,405 in continued funding from the Department of Energy for their project, Distributed Wireless Sensor Networks For Long-Term Deployments.

For their project, From Frames To Events: A Statistical Approach To Behavior Analysis In Multi-Camera Systems, **VENKATESH SALIGRAMA** (PI) and **JANUSZ KONRAD** (Co-PI) received \$507,364 in continued funding from the NSF. The NSF also awarded Saligrama \$400,000 in continued funding for his project, CPS: Medium: Collaborative Research: The Foundations Of Implicit And Explicit Communication In Cyberphysical Systems.

DAVID STAROBINSKI (PI) and **ARI TRACHTENBERG** (Co-PI) received \$456,731 in continued funding from the NSF for their project, CIF: Small: Large-Scale Software Dissemination in Stochastic Wireless Networks.

Events

ECE Day 2011

Initiated in 1997, ECE Day is a forum for seniors to present their capstone projects. Held at the end of the spring semester, ECE Day 2011 included 14 senior design presentations attended by students, faculty, alumni, and industry representatives.

MS Project Symposia

The MS Project Symposia are events that give MS students who have participated in a faculty-advised project course an opportunity to present their completed work to their peers and faculty. Symposia are held at the end of each semester. This year's events were August 6, 2010; December 10, 2010; and May 6, 2011.

Smart Spaces: A Smart Lighting ERC Academia - Industry Day

The Smart Lighting Engineering Research Center (ERC) convened its second Academia-Industry Day at the Boston University Photonics Center on February 8, 2011. The conference focused on the latest developments on "smart spaces" that integrate illuminators, sensors, controllers and communications technology into LED-based lighting systems. Potentially, smart spaces could boost workplace productivity, detect bio-terror agents, and even reduce energy consumption in buildings on the Smart Grid. The conference featured presentations and posters

from faculty and students representing the ERC's three core institutions – Rensselaer Polytechnic Institute (RPI), Boston University, and the University of New Mexico (UNM) – and observations from industry experts. Founded in 2008 by the National Science Foundation, the ERC is a multi-year, \$4 million-per-year, interdisciplinary program that facilitates research, industrial collaborations and educational initiatives aimed at advancing intelligent lighting systems and a robust smart lighting industry.

Distinguished Speaker Series

Now in its second year, the Distinguished Lecture Series continued to offer a set of high-profile invited lectures delivered by some of the brightest luminaries in both academia and industry in the fields of electrical and computer engineering. The ECE Department welcomed Professor Shih-Fu Chang, chairman of electrical engineering at Columbia University; Professor Mark A. Horowitz, chair of the electrical engineering department at

Stanford University; Professor Khalil Najafi, chair of the electrical and computer engineering department at the University of Michigan; Professor Rajesh K. Gupta, chair of computer science and engineering at the University of California, San Diego; Dr. Nick Bowen, vice president of software appliances at IBM; and Mark J. T. Smith, dean of the graduate school at Purdue University.

ECE Undergraduate Research and Lab Job Fair

The ECE Department hosted its first-ever ECE Undergraduate Research and Lab Job Fair on January 31, 2011. Designed to give undergraduate students an opportunity to speak with faculty and graduate students working in an ECE lab, the fair also provided a chance for students to add research experience to their resumes.



The ECE Undergraduate Research and Lab Job Fair gave students a chance to add research experience to their resumes.

Distinguished Lecture Series

In 2011 the ECE Department continued its Distinguished Lecture Series, high-profile invited lectures delivered by luminaries

from both academia and industry. The following are biographical sketches of this year's Distinguished Lecturers.

Shih-Fu Chang — September 29, 2010

Professor and Chairman of Electrical Engineering, Director of the Digital Video and Multimedia Lab, Columbia University

"Visual Search: State of the Art and Open Issues"



Shih-Fu Chang is professor and chairman of electrical engineering and the director of the digital video and multimedia lab at Columbia University. He has also led the ADVENT research consortium at Columbia University, during which more than 25 industry sponsors participated. He has

made significant contributions in multimedia search, media forensics, mobile media adaptation and international standards.

He has been recognized with several awards, including the IEEE Kiyo Tomiyasu Technical Field Award (for contributions to image search and classification), IBM Faculty Award, Navy ONR Young Investigator Award, ACM Recognition of Service Award and NSF CAREER Award. He and his students also received four Best Paper Awards and seven Best Student Paper Awards from IEEE, ACM and SPIE. Many video indexing technologies developed by his group have been licensed to companies.

Mark A. Horowitz — October 20, 2010

Chair of the Electrical Engineering Department and the Yahoo! Founders Professor, Stanford University

"Encapsulating Designer Knowledge: Improving Digital and Mixed Signal Design"



Mark A. Horowitz is the chair of the Electrical Engineering Department and the Yahoo! Founders Professor at Stanford University. He is also a founder of Rambus, Inc., a fellow of IEEE and ACM, and a member of the National Academy of En-

gineering and the American Academy of Arts and Sciences. Dr. Horowitz's research interests are quite broad and span applying EE and CS analysis methods to problems in molecular biology to creating new design methodologies for analog and digital VLSI circuits.

Khalil Najafi — November 10, 2010

Professor of Engineering and the Chair of Electrical and Computer Engineering, University of Michigan

"Biomedical Wireless Integrated Microsystems (BioWIMS)"



Khalil Najafi is the Schlumberger Professor of Engineering and the Chair of Electrical and Computer Engineering at the University of Michigan. He served as the director of the Solid-State Electronics Laboratory from 1998-2005, has been the director of NSF's National Nanotechnol-

ogy Infrastructure Network (NNIN) since 2004 and the deputy director of the NSF ERC on Wireless Integrated Microsystems (WIMS) since 2000. He received his BS, MS, and PhD degree in 1980, 1981, and 1986 respectively, all in electrical engineering from the University of Michigan. His research interests include: micromachining technologies, micromachined sensors, actuators, and MEMS; analog integrated circuits; microsystems and

micromachined sensors and actuators for biomedical applications; hermetic and vacuum packaging technologies; and low-power wireless sensing/actuating systems. Dr. Najafi has been active in the field of solid-state sensors and actuators for more than 25 years. He is an associate editor for the IEEE Journal of Micro Electromechanical Systems (JMEMS) and the Journal of Micromechanics & Microengineering, Institute of Physics Publishing, as well as an editor for the Journal of Sensors and Materials. He also served as associate editor for the IEEE Journal of Solid-State Circuits from 2000-2004, editor for solid-state sensors for IEEE Transactions on Electron Devices from 1996-2006, and associate editor for IEEE Transactions on Biomedical Engineering from 1999-2000. He is a fellow of the IEEE and the AIBME.

Rajesh K. Gupta — January 26, 2011

Chair of Computer Science and Engineering, University of California, San Diego

“The Variability Expeditions: Exploring the Software Stack for Under-Designed Computing Machines”



Rajesh K. Gupta is a professor and chair of Computer Science and Engineering at UC San Diego and holds the title of QUALCOMM Endowed Chair. His research interests are in energy efficient systems that have taken a turn toward large-scale energy use in recent years. His recent contributions include SystemC modeling and SPARK parallelizing high-level synthesis. Earlier Gupta led or co-led DARPA-sponsored efforts under the Data Intensive Systems (DIS) and Power Aware Computing and Communications (PACC) programs that demonstrated architectural adaptation and compiler optimization

in building high performance and energy efficient system architectures. His ongoing efforts include energy-efficient data-centers and large scale computing using memory-coherent algorithmic accelerators and non-volatile storage systems. In recent years, Gupta and his students have received a best paper award at IEEE/ACM DCOSS '08 and a best demonstration award at IEEE/ACM IPSN/SPOTS '05. Gupta received his B.Tech. degree in Electrical Engineering from IIT Kanpur, M.S. in Electrical Engineering & Computer Sciences from UC Berkeley, and a Ph.D. in Electrical Engineering from Stanford University. He currently serves as Editor-in-Chief of IEEE Embedded Systems Letters. Gupta is also a fellow of the IEEE.

tions in building high performance and energy efficient system architectures. His ongoing efforts include energy-efficient data-centers and large scale computing using memory-coherent algorithmic accelerators and non-volatile storage systems. In recent years, Gupta and his students have received a best paper award at IEEE/ACM DCOSS '08 and a best demonstration award at IEEE/ACM IPSN/SPOTS '05. Gupta received his B.Tech. degree in Electrical Engineering from IIT Kanpur, M.S. in Electrical Engineering & Computer Sciences from UC Berkeley, and a Ph.D. in Electrical Engineering from Stanford University. He currently serves as Editor-in-Chief of IEEE Embedded Systems Letters. Gupta is also a fellow of the IEEE.

Nick Bowen — February 16, 2011

Vice President of Software Appliances, IBM

“Technology Disruptions and Trends: The Next Decade”



Dr. Nicholas (Nick) Bowen was appointed the Vice President of Software Appliances at IBM in October 2010. He leads an effort in IBM's software division to drive a common hardware delivery model as well as optimize the ease of client experience with these products and drive innovation

in terms of hardware-software optimization. He previously had corporate wide responsibilities for the technical community including technical recognition and appointments to IBM Fellow and Distinguished Engineer. Nick's career with IBM spans over

26 years and he has experience as a research scientist, leader of very large global development teams, and driving corporate wide strategy projects. He received the B.S. degree in computer science from the University of Vermont, a M.S. degree in computer engineering from Syracuse University, and the Ph.D. in electrical and computer engineering from the University of Massachusetts at Amherst. He is a senior member of the IEEE and a member of ACM. He served on several Computer Science Advisory Boards and is currently on the IEEE Computer Society Industrial Advisory Board. His research interests are on operating systems and fault-tolerant computing.

Mark J. T. Smith — March 2, 2011

Dean of the Graduate School, Professor, Purdue University

“Improved Models for Accent Detection and Voice Synthesis”



Mark J. T. Smith received his B.S. degree from the Massachusetts Institute of Technology and his M.S. and Ph.D. degrees from the Georgia Institute of Technology, all in electrical engineering. He joined the electrical engineering faculty at Georgia Tech in

1984 and later served as the executive assistant to the president of the institute from 1997-2001. In January 2003, he joined the faculty at Purdue University as head of the School of Electrical and Computer Engineering. Presently, he serves as Dean of the Graduate School and holds the Michael J. & Katherine R. Birck endowed professorship. Dr. Smith is a fellow of the IEEE and a

former IEEE Distinguished Lecturer in Signal Processing. He has authored many papers in the areas of speech and image processing, filter banks, and wavelets and is the co-author of two introductory books titled, Introduction to Digital Signal Processing and Digital Filtering. He is also co-editor of the book, Wavelets and Subband Transforms: Design and Applications, and the co-author of the textbook, A Study Guide for Digital Image Processing. In addition to professional service, teaching, and research, Dr. Smith's past includes athletic training and competition in the sport of fencing. He was National Champion of the United States in 1981 and 1983 and a two-time member of the U.S. Olympic Team in 1980 and 1984.

Faculty and Staff

Core Faculty



MURAT ALANYALI

Associate Professor

Communication networks; performance analysis and optimization; stochastic systems

- » PhD, University of Illinois, Urbana-Champaign, 1996
- » NSF CAREER Award, 2003
- » Legacy Gift Award, College of Engineering, 2004
- » Associate Editor, IEEE Control Systems Society Conference Editorial Board



HATICE ALTUG

Assistant Professor

Nanoscale photonic materials and devices; nano-plasmonics; optics of metallic nanostructures; nano-photonics; photonic crystals; bio-photonics; optical biosensors and spectroscopy; opto-fluidics and lab-on-a-chip integration

- » PhD, Stanford University, 2006
- » Photonics Society Young Investigator Award, 2011
- » Boston University Early Career Research Excellence Award, 2010
- » ONR Young Investigator Award, 2010
- » NSF CAREER Award, 2010
- » New Investigator Award, Massachusetts Life Sciences Center, 2009
- » Boston University Peter Paul Career Development Professorship, 2008
- » Boston University College of Engineering Dean's Catalyst Award, 2008
- » Best Research Paper, IEEE LEOS Conference, 2006



ENRICO BELLOTI

Associate Professor

Computational electronics; semiconductor materials and device simulations; power electronics; parallel computing

- » PhD, Georgia Institute of Technology, 1999
- » NSF CAREER Award, 2005
- » ONR Young Investigator Award, 2003



IRVING BIGIO

Professor

Medical application of optics, lasers, and spectroscopy; biophotonics; nonlinear optics; applied spectroscopy; laser physics

- » PhD, University of Michigan, 1974
- » Fellow - Optical Society of America, American Society for Lasers in Medicine and Surgery, American Institute for Medical & Biological Engineering
- » Boston University College of Engineering Distinguished Lecturer, 2010
- » Faculty Service Award, 2007
- » Associate Editor, *Journal of Biomedical Optics*
- » Associate Editor, *Lasers in the Life Sciences*
- » Invited Nominator, Nobel Prize in Physics, 2007



RICHARD BROWER

Professor

Molecular dynamics simulation for biomolecules; lattices methods for QCD and statistical mechanics; quantum field theory of strings and particles

- » PhD, University of California, 1969
- » A.P. Sloan Research Fellow, SLAC and MIT., 1974-1976
- » Past Managing Editor, *International Journal of Computational Physics*



DAVID CAMPBELL

Professor & Provost

General nonlinear phenomena and complex systems; novel electronic materials; electron transport in semiconductor superlattices

- » PhD, Cambridge University, 1970
- » Fellow - American Physical Society, American Association for the Advancement of Science
- » Editor-in-Chief, *Chaos*; Editor, *Physics Reports*



JEFFREY CARRUTHERS

Associate Professor

Photonic wireless communication; mobile and wireless networks; engineering education

- » PhD, University of California, Berkeley, 1997
- » NSF CAREER Award, 1999
- » Senior Member, IEEE
- » ECE Professor of the Year, Boston University, 2010
- » ECE Award for Excellence in Teaching, 2001



CHRISTOS CASSANDRAS

Professor

Discrete event and hybrid systems; stochastic control and optimization; computer and communication networks; wireless sensor networks; manufacturing systems; supply chain management; computer simulation; command-control systems

- » PhD, Harvard University, 1982
- » Fellow, IEEE
- » Fellow, IFAC
- » Editor-in-Chief, *IEEE Transactions on Automatic Control*, 1998-2009
- » Member, IEEE Control Systems Society Board of Governors
- » Lilly Fellow, 1991
- » Distinguished Member Award, IEEE Control Systems Society, 2006
- » Harold Chestnut Prize, (IFAC Best Control Engineering Textbook), 1999
- » IEEE Distinguished Lecturer, 2001-2004
- » Department Editor, *Journal of Discrete Event Dynamic Systems*, 1989-present
- » Associate Editor, *International Journal of Intelligent Computing and Cybernetics*, 2007-present
- » Associate Editor, *International Journal of BioSciences and Technology*, 2008-present
- » Associate Editor, *Automatica*, 1993-2002
- » Associate Editor, *IEEE Transactions on Automatic Control*, 1991-1993
- » Editor, Technical Notes and Correspondence, *IEEE Transactions on Automatic Control*, 1994-1998
- » Honorary Professor, Huazhong University of Science and Technology
- » Honorary Professor, Wuhan University of Science and Technology
- » President-Elect, IEEE Control Systems Society, 2011



DAVID CASTAÑÓN

Professor, Ad Interim Department Chair
Stochastic control; estimation optimization; image understanding and parallel computation

- » PhD, Massachusetts Institute of Technology, 1976
- » Past President, IEEE Control Systems Society (CSS)
- » IEEE CSS Distinguished Member Award
- » Air Force Advisory Board Member
- » ECE Teaching Award, 2007
- » Associate Editor, *Computational Optimization and Applications*
- » Past Associate Editor, *IEEE Transactions on Automatic Control*



AYSE COSKUN

Assistant Professor
Temperature and energy management, 3D stacked architectures, reliability analysis and optimization, computer architecture, embedded system design

- » PhD, University of California, San Diego, 2009
- » Design Automation Conference, A. Richard Newton Graduate Scholarship Award, 2011
- » BU ENG Dean's Catalyst Award, 2010
- » Best Paper Award, 17th IFIP/IEEE VLSI-SoC



LUCA DAL NEGRO

Assistant Professor
Optical amplification phenomena and laser physics; optical spectroscopy of semiconductor nanostructures; photonic crystals, anderson light localization and aperiodic dielectrics; nanophotonics and plasmonics

- » PhD, University of Trento, 2003
- » NSF CAREER Award, 2009
- » BU Early Career Research Excellence Award
- » Dean's Catalyst Award, 2007



DOUGLAS DENSMORE

Assistant Professor
High level languages for synthetic biology; data exchange standards for biological parts and devices; system level design of embedded systems; computer architecture

- » PhD, University of California, Berkeley, 2007
- » Richard and Minda Reidy Family Career Development Professor, 2010
- » International Genetically Engineering Machine (iGEM) Competition Best Software Tool, 2008-2009
- » UC Chancellor's Postdoctoral Fellow, 2007-2009



ROSCOE GILES

Professor
Advanced computer architectures; distributed and parallel computing; computational science

- » PhD, Stanford University, 1975
- » One of the "50 Most Important Blacks in Research Science," The Career Communications Group (CCG)
- » A. Nico Haberman Award, CRA
- » ENG Award for Excellence in Teaching, 1996



MARTIN HERBORDT

Associate Professor
Computer architecture; high performance computing systems and applications; configurable computing; high-level design automation; bioinformatics and computational biology

- » PhD, University of Massachusetts, 1994
- » BU ENG Dean's Catalyst Award, 2010
- » IBM Faculty Award, 2008
- » NSF CAREER Award, 1997



MARK HORENSTEIN

Professor
Applied electromagnetics; electrostatics; microelectromechanical systems

- » PhD, Massachusetts Institute of Technology, 1978
- » Editor-in-Chief, *Journal of Electrostatics*



ALLYN HUBBARD

Professor
VLSI design using analog and digital techniques in CMOS; neural net chips, smart sensor chips, and chips with biological applications; models of the peripheral auditory system

- » PhD, University of Wisconsin-Madison, 1977
- » College of Engineering Award for Excellence in Teaching, 2002



PRAKASH ISHWAR

Associate Professor
Network information theory and communications; statistical signal processing and machine learning; visual information processing

- » PhD, University of Illinois Urbana-Champaign, 2002
- » NSF CAREER Award, 2005
- » AVSS Best Paper Award (with K. Guo and J. Konrad), 2010
- » ICPR SDHA contest win (with K. Guo and J. Konrad), 2010
- » Dean's Catalyst Award, 2007
- » Senior Member, IEEE
- » Elected Member, IEEE IVMS Technical Committee



AJAY JOSHI

Assistant Professor
On-chip and off-chip interconnect design, digital/analog circuit design, physical design, computer architecture

- » PhD, Georgia Institute of Technology, 2006
- » Dean's Catalyst Award, College of Engineering, Boston University, 2011
- » Intel Recognition Award, 2003



W. CLEM KARL

Professor
Multidimensional and multiscale signal and image processing and estimation, particularly applied to geometrically and medically oriented problems; statistical signal processing; biomedical signal and image processing

- » PhD, Massachusetts Institute of Technology, 1991
- » ECE Award for Excellence in Teaching, 2000
- » Past Associate Editor, *Tomography & MRI, IEEE Transactions on Image Processing*
- » Past Assistant Editor, *Systems Control Newsletter*
- » Vice-Chair, IEEE Bio Signal and Image Processing Technical Committee
- » Member, Image, Video, and Multidimensional Signal Processing Technical Committee



MARK KARPOVSKY

Professor
Design of secure cryptographic devices and smart cards; routing in interconnection networks; design and protection of cryptographic devices; fault-tolerant computing; error correcting codes; testing and diagnosis of computer hardware

- » PhD, Leningrad Electrotechnical Institute, 1967
- » Fellow, IEEE



RONALD KNEPPER

Professor

VLSI integrated circuit technology; SiGe BICMOS device and circuit modeling; silicon CMOS & bipolar devices; numerical device simulation; RF/analog IC design

- » PhD, Carnegie Mellon University, 1969
- » Life Fellow, IEEE
- » IBM Outstanding Innovation Award, 1989
- » IBM Division Award, 1988
- » IBM Outstanding Technical Achievement Award, 1983
- » Past Editor, *Solid State Electronics*



JANUSZ KONRAD

Professor

Visual sensor networks; image and video processing; stereoscopic and 3-D imaging; digital signal processing

- » PhD, McGill University, 1989
- » Fellow, IEEE
- » ECE Professor of the Year, Boston University, 2011
- » IEEE Signal Processing Magazine Award, 2001
- » EURASIP Image Communications Best Paper Award, 2004-2005
- » AVSS Best Paper Award (with K. Guo and P. Ishwar), 2010
- » ICPR SDHA Contest Win (with K. Guo and P. Ishwar), 2010
- » Dean's Catalyst Award, 2007
- » Associate Editor, *EURASIP Journal on Image and Video Processing*, 2006-2010
- » Associate Editor, *Signal Processing Letters*, 2002-2004
- » Associate Editor, *IEEE Transactions on Image Processing*, 1996-2000
- » Associate Technical Editor, *IEEE Communications Magazine*
- » Area Editor, *EURASIP Signal Processing: Image Communication*



ROBERT KOTIUGA

Associate Professor

Electromagnetics; numerical methods for three-dimensional vector field problems; Whitney forms and the Finite Element Method; micromagnetics; nanoscale magnetics; geometric inverse problems; topological aspects of magnetic scalar potentials; helicity functionals; analysis of high performance interconnects

- » PhD, McGill University, 1985
- » Member, Electromagnetics Academy
- » Dean's Catalyst Award, 2007



MIN-CHANG LEE

Professor

Alternative energy sources and environmental impacts; radio communications; experimental plasma physics; ionospheric plasma physics

- » PhD, University of California, San Diego, 1977
- » BU ECE Award for Excellence in Teaching, 2008
- » Arecibo Observatory certificate in recognition of distinguished user, 2005
- » Past Associate Editor, *AGUs Radio Science*



LEV LEVITIN

Professor

Information theory; physics of communication and computing; complex and organized systems; bioinformatics; quantum theory of measurement; reliable communication and computing

- » PhD, USSR Academy of Sciences, Gorky University, 1969
- » Life Fellow, IEEE
- » Member, International Academy of Informatization



THOMAS LITTLE

Professor, Associate Chair for Undergraduate Studies
Mobile Ad Hoc Networks (MANETs); pervasive and multimedia computing; vehicular networking; embedded sensor networks

- » PhD, Syracuse University, 1991
- » NSF Research Initiation Award, 1991
- » NSF CAREER Award, 1995
- » Dean's Catalyst Award, 2007
- » BU College of Engineering Faculty Service Award, 2009
- » Kern Faculty Fellow, 2010
- » Editorial Board Member, ACM/Springer Multimedia Systems, *Journal of Multimedia Tools and Applications*



THEODORE MORSE

Professor

Photonic material processing; optical fiber fabrication, lasers, and sensors; high power double clad fiber lasers

- » PhD, Northwestern University, 1961
- » Fulbright Fellow, Germany



THEODORE MOUSTAKAS

Professor

Growth by MBE, HVPE and MOCVD and gas-cluster ion beam deposition (GCIB); growth, fabrication and characterization of optical devices (UV-LEDs, UV-LDs, optical modulators, detectors); electronic devices (high power diodes, transistors and thyristors) and electromechanical devices (SiC/III-Nitride MEMS sensors); III-nitride semiconductors (materials growth and device fabrication)

- » PhD, Columbia University, 1974
- » Associate Director of the Materials Science and Engineering Division
- » Honorary Doctorate, Aristotle University for Excellence in Research
- » Fellow, American Physical Society,
- » Fellow, Electrochemical Society
- » Senior member, IEEE
- » BU College of Engineering Dean's Catalyst Award, 2009
- » ECE Award for Excellence in Teaching, 1998
- » Cited in "Technology Transfer Works: 100 Cases from research to realization," Better World Project
- » Special editor of the *Journal of Vacuum Science and Technology* and *Journal of Electronic Materials*.
- » Molecular Beam Epitaxy (MBE) Innovator Award, 2010
- » Distinguished Scholar of the BU College of Engineering, 2011



S. HAMID NAWAB

Professor

Computational signal processing; applied artificial intelligence; analysis algorithms for EMG signals; analysis algorithms for patient activity signals; analysis algorithms for auditory signals

- » PhD, Massachusetts Institute of Technology, 1982
- » College of Engineering Service Award, 2005
- » College of Engineering Award for Excellence in Teaching, 1998
- » Metcalf Award for Excellence in Teaching, 1993
- » Fellow - American Institute for Medical & Biological Engineering



BOBAK NAZER

Assistant Professor

Information theory and communications; reliable computation over networks; distributed signal processing

- » PhD, University of California, Berkeley, 2009
- » Dean's Catalyst Award, College of Engineering, Boston University, 2011
- » Eli Jury Award, EECS Department, UC Berkeley, 2009



WILLIAM OLIVER

Associate Professor

Radar studies of the upper atmosphere and ionosphere; modeling and simulation; global change in the upper atmosphere

- » PhD, University of Illinois, 1973



ROBERTO PAIELLA

Assistant Professor

Device physics and applications of semiconductor quantum structures; optoelectronic devices based on group-III nitride semiconductors; terahertz photonics; plasmonics and related optoelectronic device applications; novel device concepts and circuit architectures for ultrafast all-optical information processing

- » PhD, California Institute of Technology, 1998
- » Senior Member, IEEE
- » BU Office of Technology Development Ignition Award, 2008
- » BU College of Engineering Dean's Catalyst Award, 2009
- » BU College of Engineering Dean's Catalyst Award, 2011
- » Vice Chair, IEEE Laser and Electro-Optics Society (LEOS), New England Chapter



IOANNIS PASCHALIDIS

Professor

Systems and control; networking; applied probability; optimization; operations research; computational biology; communication and sensor networks; protein docking; logistics; cyber-security; robotics; smart-grid; finance

- » PhD, Massachusetts Institute of Technology, 1996
- » IEEE Senior Member
- » National Science Foundation CAREER Award, 2000
- » Second Prize, INFORMS 1997 George E. Nicholson paper competition
- » Past Associate Editor, *IEEE Transactions on Automatic Control*
- » Past Associate Editor, *Operations Research Letters*
- » First prize in the 3rd Critical Assessment Predicted Protein Interaction (CAPRI) Evaluation Meeting, 2007
- » Invited participant, 2002 US Frontiers of Engineering Symposium, National Academy of Engineering
- » Plenary Speaker, LIDS Student Conference, Laboratory for Information and Decision Systems, Massachusetts Institute of Technology (MIT), 1998 and 2002
- » Dean's Catalyst Award, College of Engineering, Boston University, 2011
- » Joint paper with student, Reza Moazzez-Estanzjini, won the best student paper award at the 9th International Symposium of Modeling and Optimization in Mobile, Ad Hoc, and Wireless Networks (WiOpt '11)
- » Best performance in modeling protein-protein complexes (with D. Kozakov, P. Vakili, S. Vajda, et. al.), CAPRI, evaluation meeting, 2009



ALAN PISANO

Associate Professor of the Practice

Power systems and smart grid; MIMO control systems; aircraft survivability; prognostics and health management as applied to rotorcraft; jet engine diagnostics

- » PhD, Northeastern University, 1974
- » General Electric Lifetime Achievement Award
- » Seven issued patents



SIDDHARTH RAMACHANDRAN

Associate Professor

Optical physics of guided waves; micro- and nano-structured optical fibers; high-power fiber lasers and fiber sensors; biomedical imaging and microscopy with optical fibers

- » PhD, University of Illinois, Urbana-Champaign, 1998
- » Fellow, Optical Society of America (OSA)
- » Distinguished Member of Technical Staff, OFS Laboratories, 2003
- » Topical Editor, *Optics Letters*
- » Book editor, Springer-Verlag
- » Guest Editor, *IEEE-JSTQE issue on High-Power Fiber Lasers*



VENKATESH SALIGRAMA

Associate Professor

Information and control theory; statistical signal processing; network science; video analysis; machine learning

- » PhD, Massachusetts Institute of Technology, 1997
- » NSF CAREER Award, 2005
- » ONR Presidential Early Career Award, 2003
- » ONR Young Investigator Award, 2002
- » Featured Speaker, Homeland Security Summit, 2009
- » Keynote Speaker, RICC, Northeastern University, 2009
- » Plenary Speaker, Northeast Control Conference, 2006
- » Plenary Speaker, LIDS student conference, 2001
- » Associate Editor, *IEEE Transactions on Signal Processing*, 2005-2008
- » Outstanding Achievement Award, United Technologies, 1998



JOSHUA SEMETER

Associate Professor

Ionospheric and space plasma physics; spectroscopy of atmospheric airglow and the aurora borealis; image processing; radar systems and radar signal processing

- » PhD, Boston University, 1997
- » SRI Presidential Achievement Award, 2004
- » Prize Lecture, NSF Cedar Workshop, 2000
- » Associate Editor, *Journal of Geophysical Research*
- » NSF CAREER Award, 2006
- » ECE Award for Excellence in Teaching, 2009
- » Associate Director, BU Center for Space Physics



ALEXANDER SERGIENKO

Professor

Quantum state engineering; entanglement manipulation and processing; ultrafast quantum optics; quantum information processing; quantum cryptography and communication; quantum networking; linear-optical quantum computing; ultra-precise optical measurement in science and technology (quantum metrology); quantum nanoscale sensors and sensor networks; quantum bio-photonics; characterization and diagnostics of biological materials and devices for life sciences and proteomics; study of fundamental optical interactions

- » PhD, Moscow State University, 1987
- » NSF CAREER Award, 1999
- » Fellow, Optical Society of America
- » ECE Award for Excellence in Teaching, 2001



DAVID STAROBINSKI

Associate Professor

Wireless networking; network economics, cyber-security, modeling and performance analysis of communication networks

- » PhD, Technion, Israel Institute of Technology, 1999
- » ECE Faculty Teaching Award, 2010
- » WiOpt Symposium Best Paper Award, 2010
- » EPFL Visiting Professor Fellowship, 2009
- » IEEE Senior Member, 2007
- » Department of Energy Early Career Award, 2004
- » NSF CAREER Award, 2002
- » Associate Editor, *IEEE/ACM Transactions on Networking*



ANNA SWAN

Associate Professor

Optical studies using Raman spectroscopy; rayleigh scattering and time-resolved pump-probe experiments to study electronic and vibrational properties and energy dissipation mechanisms and exciton dynamics of low dimensional system-graphene and carbon nanotubes; studies performed on single; individual nanotubes and quantum dots, spectral self-interference spectroscopy for high resolution imaging and biosensing

- » PhD, Boston University, 1993
- » Dean's Catalyst Award, College of Engineering, Boston University, 2011
- » Senior Member, IEEE



MALVIN TEICH

Professor

Quantum optics and imaging; photonics; fractal stochastic processes; information transmission in biological sensory systems

- » PhD, Cornell University, 1966
- » Fellow, IEEE, American Physical Society, Acoustical Society of America, American Association for the Advancement of Science, John Simon Guggenheim Foundation, Optical Society of America, International Society for Optics and Photonics (SPIE)
- » IEEE Morris E. Leeds Award, 1997
- » Palacky University Memorial Gold Medal, 1992
- » IEEE Browder J. Thompson Memorial Prize, 1969
- » IEEE EMBS Distinguished Lecturer
- » OSA Traveling Lecturer
- » Editorial Advisor, Photonics and Physical Electronics, *Physics Today*



ARI TRACHTENBERG

Associate Professor, Associate Chair for Graduate Studies

Error correcting codes; data synchronization (especially for PDAs and mobile networks); sensor-based location detection; algorithms; security

- » PhD, University of Illinois, Urbana-Champaign, 2000
- » NSF CAREER Award, 2002
- » ECE Award for Excellence in Teaching, 2003
- » Senior Member, IEEE
- » BU ENG Innovative Engineering Education Faculty Fellowship, 2009



SELIM ÜNLÜ

Professor and Associate Dean for Research and Graduate Programs

Near-field optical microscopy and spectroscopy of semiconductor materials and devices; design, processing, characterization, and simulation of semiconductor optoelectronic devices; nanoscale imaging of biological samples; biosensors

- » PhD, University of Illinois, Urbana-Champaign, 1992
- » NSF CAREER Award, 1996
- » ONR Young Investigator Award, 1996
- » TUBITAK Special Award, 2008
- » ECE Award for Excellence in Teaching, 2002
- » Fellow, IEEE
- » Associate Editor, *IEEE Journal of Quantum Electronics*
- » College of Engineering Service Award, 2006
- » Dean's Catalyst Award, 2007
- » ARCNN Distinguished Lecturer, 2007
- » IEEE/LEOS Distinguished Lecturer, 2005-2007

Affiliated Faculty



JOHN BAILLEUL

Professor, Mechanical Engineering
Robotics; control of mechanical systems; mathematical system theory; information-based control theory



SUPRIYA CHAKRABARTI

Professor, Astronomy
Experimental astrophysics; spectral imaging; astrophysics from space; planetary atmospheres; interplanetary, interstellar and intergalactic media



CARLO DE LUCA

Professor, Biomedical Engineering
Motor control of normal and abnormal muscles; objective assessment of functional activities in humans; advanced technology for detecting and applying biosignals



SOLOMON EISENBERG

Professor and Chair, Biomedical Engineering
Joint Faculty Member (BME, ECE)
Electrically mediated phenomena in tissues and biopolymers; cartilage biomechanics; computational modeling of electric field distributions in the human thorax and heart during defibrillation; transcranial magnetic stimulation



FAROUK EL-BAZ

Research Professor and Director, Center for Remote Sensing
Remote sensing with emphasis on arid lands; surface features of solar system planets as part of comparative planetology



THEODORE FRITZ

Professor, Astronomy
Space plasma and magnetospheric physics; magnetosphere-ionosphere coupling; substorms; charged particles and compositions; rocket and satellite experiments



BENNETT GOLDBERG

Professor and Chair, Physics
Professor, Biomedical Engineering
Room- and low-temperature, near-field scanning optical microscopy and spectroscopy in semiconductors and biological systems; ultra-high spatial resolution combined with time-resolved spectroscopy provide new ways of examining mesoscopic systems; magneto-optics and magneto-transport of two- and one-dimensional electron systems used to examine spin-textures in interacting electrons



LEE GOLDSTEIN

Associate Professor, Biomedical Engineering
Associate Professor, Psychiatry, Neurology, Ophthalmology, Pathology, and Laboratory Medicine
Laser diagnostics; experimental pathology; translational neuroscience; molecular biology; biophotonics; radiobiology; biometallics; Alzheimer's disease; down syndrome; neurodegeneration; cataracts; molecular aging; ethnopharmacology



WILLIAM KLEIN

Professor, Physics
Joint Faculty Member (ECE, Physics)
Kinetics of phase transitions, the physics of earthquakes and the study of damage in materials



MICHAEL MENDILLO

Professor, Astronomy
Space physics; planetary atmospheres; observations and models



JEROME MERTZ

Associate Professor, Biomedical Engineering
Development and applications of novel optical microscopy techniques for biological imaging



ERIC SCHWARTZ

Professor, Neurobiology and Anatomy
Joint Faculty Member (ECE, BUSM)
Computational neuroscience; computer vision and robotics; neuroanatomy; neural modeling; brain imaging; physiological bases of meditation



WILLIAM SKOCPOL

Professor, Physics
Nanofabrication; device processing; transport experiments in materials

Research Faculty



MALAY MAZUMDER

Research Professor

Solar energy systems, particle technology, material engineering, electrostatic engineering

» PhD, University of Arkansas, 1971



DANIEL TSUI

Research Professor

Fundamental properties of electronic materials, especially conduction in ultrasmall structures, transport, and quantum physics of electronic materials in strong magnetic fields and low temperatures, in particular, the quantum phases and their phase transitions.

» PhD, University of Chicago, 1967



TOMMASO TOFFOLI

Research Professor

Fundamental connections between physics and computation; fine-grained modeling of physics-like systems technology (cellular automata machines) and methodology (programmable matter); personal knowledge structuring

» PhD, Physics, University of Rome, 1967

» PhD, Computer and Communication Sciences, University of Michigan, 1977

Emeritus Faculty



JOHN BRACKETT

Professor Emeritus

Software engineering; software requirements definition; object-oriented testing; rapid prototyping of embedded systems

» PhD, Purdue University, 1963



MICHAEL RUANE

Professor Emeritus

Resonant cavity imaging systems; K-12 outreach and engineering education; optical systems; instrument design

» PhD, Massachusetts Institute of Technology, 1980



THOMAS KINCAID

Professor Emeritus

Signal and image processing; neurodynamics; non-destructive testing

» PhD, Massachusetts Institute of Technology, 1965



BAHAA E.A. SALEH

Professor Emeritus

Quantum optics; nonlinear optics; image processing

» PhD, Johns Hopkins University, 1971



DAVID PERREAUULT

Professor Emeritus

Nonlinear networks; computer-aided design; microprocessors; distributed digital networks

» PhD, Purdue University, 1968



RICHARD VIDALE

Professor Emeritus

Modeling and simulation, software engineering

» PhD, University of Wisconsin-Madison, 1964

Adjunct Faculty

JOHN BRACKETT

EC728 (Fall 2010) and EC518 (Spring 2011)

» PhD, Purdue University, 1963

VLADIMIR KLEPSTYN

EC578 (Fall 2010)

» PhD, Moscow Lomonosov's Institute of Fine Chemical Technology, 1983

BABAK KIA MONTAZAM

EC464 (Spring 2011) and EC757 (Summer 2011)

» MS, Boston University, 1996

THOMAS SKINNER

EC447 (Fall 2010) and EC512 (Spring 2011)

» PhD, Boston University, 1982

TOM VAN COURT

EC551 (Fall 2010)

» PhD, Boston University, 2006

Staff

Administrative Staff

WAYNE RENNIE

Department Director

CARLY MARCHIONI

Assistant Department Director

JULIE GUTHRIE

Academic Programs Manager

AUSTIN ALEXANDER

Senior Programs Coordinator

BECKY BELL

Assistant to the Chair

RYAN FLAMENT

Financial Administrator

DAVID DELAKAS

Grants Administrator

RACHEL HARRINGTON

*Publications, New Media, and
Promotions Administrator*

Technical Staff

JAMES GOEBEL

Manager, Systems Support, ENG

ILYAS HAMDI

Manager, Instruction Labs

ALEXEY NIKIFOROV

MBE Laboratory Manager

VLADIMIR KLEPSTYN

Electronic/Circuits Lab Manager

Research Staff

NAME	TITLE	ADVISOR
Azimi, Mohammed	Visiting Researcher	Altug
Bertazzi, Francesco	Post-Doctoral Associate	Bellotti
Bhatia, Swapnil	Post-Doctoral Associate	Densmore
Boriskina, Svetlana	Post-Doctoral Associate	Dal Negro
Borogovac, Tarik	Post-Doctoral Associate	Little
Capretti, Antonio	Visiting Researcher	Dal Negro
Caron, Andre	Visiting Researcher	Saligrama
Chen, Kai	Post-Doctoral Associate	Altug
Chivas, Robert	Post-Doctoral Associate	Morse
Chu, Larry	Visiting Researcher	Cerrina
Chiaria, Simone	Visiting Researcher	Bellotti
Dahlgren, Hanna	Post-Doctoral Associate	Semeter
Di Martino, Giuliana	Visiting Researcher	Dal Negro
Do, Synho	Visiting Researcher	Karl
Freedman, David	Post-Doctoral Associate	Ünlü
Goto, Maso	Visiting Researcher	Ramachandran
Grogan, Michael	Post-Doctoral Associate	Ramachandran
Jiang, Fan	Post-Doctoral Associate	Cerrina
Koklu, Hakan	Post-Doctoral Associate	Ünlü
Koseoglu, Mehmet	Visiting Researcher	Alanyali
Lopez, Carlos	Post-Doctoral Associate	Ünlü
Minissale, Salvatore	Post-Doctoral Associate	Dal Negro
Mohan, Nishant	Visiting Researcher	Teich
Mustafa, Mehmet	Visiting Researcher	Karpovsky
Nasr, Maged	Visiting Researcher	Teich
Pecora, Emanuele	Post-Doctoral Associate	Dal Negro
Rishoj, Lars	Visiting Researcher	Ramachandran
Rottwitt, Karsten	Visiting Researcher	Ramachandran
Rykalova, Yelena	Visiting Researcher	Levitin
Schimpf, Damian	Post-Doctoral Associate	Ramachandran
Shubochkin, Roman	Senior Post-Doctoral Associate	Morse/Ramachandran
Simon, David	Post-Doctoral Associate	Sergienko
Steinvurzel, Paul	Senior Post-Doctoral Associate	Ramachandran
Szupinski, Konrad	Research Fellow	Ünlü
Thomidis, Christos	Research Fellow	Moustakas
Tschoe, Christine	Post-Doctoral Associate	Ünlü
Turkman, Mustafa	Research Fellow	Altug
Vedula, Rahul	Research Fellow	Ünlü
Wang, Ye	Post-Doctoral Associate	Ishwar
Wu, Huan-Yu	Visiting Researcher	Konrad
Yalcin, Ayca	Post-Doctoral Associate	Ünlü
Yanik, Ahmet Ali	Research Associate	Altug

Department Administration and Committees

DAVID CASTAÑÓN	Department Chair <i>ad interim</i> (current)
THOMAS LITTLE	Associate Chair for Undergraduate Studies
ARI TRACHTENBERG	Associate Chair for Graduate Studies
WAYNE RENNIE	Department Director

Faculty committees direct the academic operations and planning for the ECE Department. The following is a list of each of our regularly convening committees, with a description of their functions and the names of the committee members (in italics).

The **Planning Committee** directs strategic planning and is involved in all strategic decisions for the Department. It plans the annual ECE Day and ECE Retreat and also recommends the scheduling of courses and the assignments of instructors. The Committee is composed of three research area coordinators, the Associate Chairs for undergraduate and graduate programs, the Department Chair, and a representative from the College of Engineering (ENG). *Castañón (Chair), Trachtenberg (Associate Chair, Grad), Little (Associate Chair, Undergrad), Herbordt (CSE), Karl (ISS), Sergienko (EP), Rennie (Director), Ünlü (ENG), Marchioni, Bell, Guthrie*

The **Undergraduate Committee** is responsible for all aspects of the undergraduate programs, including program and curricular changes; new courses; evaluation of quality of instruction and student advising; and making recommendations for fellowships, scholarships, and awards. It is in charge of closing the ABET planning feedback loop and preparing for the ABET visit. A subcommittee makes recommendations for the ECE Teaching Excellence Award. *Little (Chair), Coskun, Horenstein, Semeter, Swan, Guthrie, Alexander*

The **Graduate Committee** is responsible for all aspects of the graduate programs, including program and curricular changes; new courses; recruitment of new graduate students; making recommendations for fellowships, scholarships and awards; evaluating Graduate Teaching Fellows; assignment of theses committees; and coordination of poster presentations on ECE Day. *Trachtenberg (Chair), Alanyali, Altug, Carruthers, Densmore, Ishwar, Joshi, Nazer, Oliver, Ramachandran, Guthrie, Alexander*

The **Search Committee** is responsible for the recruitment of new faculty. It coordinates the advertisements, visits and interviews of candidates, and makes recommendations to the faculty for appointment of new faculty. *Members consist of junior and senior faculty.*

The **APT Committee** makes recommendations on appointments of tenure-track, non-tenure-track, and affiliate faculty; promotion and tenure of tenure-track faculty; and promotion to full professor. *Members consist of senior faculty.*

The **Publicity, Special Events and Seminars Committee** makes strategic recommendations for the department's web site, brochures, reports, exhibits, and all media events aimed at promoting the Department and enhancing its visibility at the national and international level. It is also in charge of the ECE Colloquium and other ad hoc seminars and research talks. *Konrad (Chair), Bellotti, Dal Negro, Horenstein (honorary), Joshi, Kotiuga, Paschilidis, Rennie, Harrington*

The **Industrial and Alumni Relations Committee** is in charge of promoting relations to local and national industry, recruitment of members of the Industrial Advisory Council (IAC), and planning IAC meetings. It helps promote strong relations to alumni by coordinating alumni visits on special events such as ECE Day and others. *Castañón (Chair), Hubbard, Knepper, Lee, Little, Pisano, Rennie, Marchioni, Bell*

The **Information Technology Committee** is in charge of maintaining, upgrading, and improving the information technology infrastructure. *Starobinski (Chair), Altug, Brower, Giles, Hubbard, Ishwar, Semeter, Rennie, Goebel, Hamdi*

The **Awards Committee** is responsible for researching awards and other recognition opportunities for department faculty members and developing strategies to strengthen the candidacies of faculty who are considered for recognition. *Teich (Chair), Cassandras (spring), Moustakas*

Undergraduate Program

The Department of Electrical & Computer Engineering continues to pride itself on developing a strong laboratory curriculum to complement our classroom teaching for undergraduates. Our labs are stocked with up-to-date equipment and we encourage undergraduates to become involved with research and development efforts through UROP (Undergraduate Research Opportunity Program), work study, and student employment. Engineering is an applied science, and we believe it is important to start applying what is learned in the classroom as soon as possible.

Central to this philosophy, the capstone design project pro-

vides our graduating seniors with real engineering experience and the student projects have continued to be outstanding, with several projects receiving awards.

We are dedicated to improving our undergraduate programs and this year exemplified that commitment. Through careful examination of student surveys, student feedback forums, and faculty review of courses and outcomes, ECE has implemented a number of curriculum changes aimed at enhancing the undergraduate experience.

FALL 2010 ENROLLMENT			
	<i>Electrical</i>	<i>Computer**</i>	<i>Total</i>
Freshmen*	35	16	51
Sophomores*	26	14	40
Juniors	36	24	60
Seniors	34	19	53
Total	131	73	204

* ENG Students are not required to declare a major until their Junior year.

** "Computer Systems Engineering" has been renamed "Computer Engineering."

Undergraduate Degrees Awarded

MAJOR	DEGREE RECIPIENTS
Computer Engineering	16
Electrical Engineering	31
Total	47

Course and Program Development

Significant effort was applied to ECE undergraduate curriculum development in 2010-11. This included the initiation of curriculum review of EE and CE programs; examination and enhancing core ECE courses; creation and introduction of new courses in increasingly relevant topics such as renewable energy systems and nanotechnology; and embedding themes from the "Societal Engineer" into the curriculum including entrepreneurship and research experiences. We also focused on bucking national trends

in ECE enrollments via new initiatives to promote recruiting and retention in the College.

CURRICULUM REVIEW

Following the recent ABET reaccreditation of 2010 and based on input from the College, ECE strategic plans, and various National Academy of Engineering (NAE) calls for action in engineering education and national competitiveness, the ECE Undergradu-

ate Committee has begun a review and reinvigoration of the EE and CE curricula. Goals of the committee include increasing enrollment in the ECE undergraduate program and leveraging the quality of engineering research in the graduate program into topics that modernize undergraduate education. These efforts are ongoing with initial proposals for curricular change in EE and CE emerging in the spring of 2011.

ENHANCING KEY COURSES

Several high-impact courses in ECE were the subject of review and retooling with an eye on promoting concepts in electrical engineering as a career choice. These include EC307: Electric Circuit Theory and EC463/464: Senior Capstone Design. EC307 gained additional faculty support for the lab component and additional engineering applications such as circuit theory have also been introduced in the course. Thanks to collaboration with the ME and BME departments, EC307 is now more flexible in sequencing during sophomore year in order to allow students to explore ECE topics earlier in their academic study. EC463/464 was updated in two significant ways: students now complete design formulation in the first semester, an acceleration from previous years, and have a chance to work on interdisciplinary/interdepartmental projects, two of which were completed in the spring of 2011.

NEW COURSES

Course development was very active in the past year with the design or introduction of five new courses. These include:

- EK128 - Engineering Computation++: This is an accelerated version of the existing EK127 course but enhanced by the addition of advanced programming concepts, development environments, and languages. The course is intended to meet the needs of CE and EE students with prior software experience.
- EK131 - Electronic Control of Robots: Offered to first-year students as part of the Introduction to Engineering options, this course promotes the application of electronics and control to problems in robotics and demonstrates the important role that ECE plays in robotics.
- EC417 - Electric Energy Systems: Adapting to Renewable Resources: This course aims to expand upon the new Energy Technology concentration in the College of Engineering by focusing on the intersection of energy systems and how they are influenced by modern renewable and distributed technologies such as PV, wind, and storage systems.

- EC470 - Sensors in Space: Leveraging the success of the BUSAT project and in collaboration with the Department of Astronomy, this course deals with space instrumentation including sensing, embedded computation, and the like applied to instruments intended for space.
- EC481 - Fundamentals in Nanotechnology and Nanomaterials: EC481 is designed to meet the growing need and interest in nanotechnologies and expands upon current research in this area in our graduate research programs.

REALIZING THE SOCIETAL ENGINEER

The College of Engineering has coined the phrase, "Societal Engineer," to describe engineers who provide a growing influence in their fields, community, and society as a whole. These engineers, deep in technical expertise but enhanced with context, values, and experience, possess the attributes that students studying in Boston University's engineering programs should strive for.

Educating and shaping societal engineers has been the touchstone of recent ECE curriculum development, and realizing this vision requires adaptation of course content, instruction, advising, and co-curricular activities. Specific activities by ECE toward this vision include:

- Introduction of entrepreneurial concepts in coursework, for example, in Senior Design via the Kern Foundation grant to the College;
- Promotion of experiential opportunities such as research opportunities at the undergraduate level;
- Enhancing and promoting interdisciplinary opportunities like interdepartmental capstone design projects; and
- Promotion of semester-abroad programs to expose students to new, multicultural experiences.

RECRUITING AND RETENTION ACTIVITIES

In addition to curriculum enhancement, the ECE department is working toward improving performance in recruiting and retaining ECE students in the undergraduate program in an effort led by Professor Mark Horenstein. Specific activities include:

- Increasing faculty participation in recruiting activities, e.g., the fall ECE Emporium and the spring Undergraduate Open House activities;
- Recruiting new ECE Student Advisors for freshmen-year EK100 advising groups;
- Enhancing an undergraduate-centric culture among faculty members;

- Promoting undergraduate research opportunities by way of a filled-to-capacity Research and Lab Job Fair that matched faculty researchers with undergraduates seeking academic-year and summer positions;
- Continuing to develop the “Is ECE Right for You?” section of the department website in order to promote understanding of opportunities in the field;
- Enhancing signage, posters, and advertising around the Photonics Building to promote EE and CE as fields of study;
- Reestablishing the first floor atrium as an “ECE area” to instill a sense of community for ECE undergraduates;
- Developing new hands-on activities as part of Spring Open House recruitment; and
- Organizing regular Town Meetings for ECE undergraduates to gain insight into problems and opportunities for improving the ECE program.

In summary, the ECE Department has been busy in 2010-11 with addressing concerns about the state of undergraduate education in the context of a very dynamic and evolving discipline. There are many opportunities for positive changes, and although this can be challenging for educators at times, it is an exciting time to be part of the ECE Department.

Undergraduate Student Awards

Students **LUKE ANDERSON**, **ANNA EVANS**, **PATRICK HENSON**, **JONATHAN KWAN**, and **ANGELO LUO** of Team GloveSense were selected by Senior Project faculty as recipients of the 2011 P. T. Hsu Memorial Award for the best overall ECE senior design project. Additionally, two teams were awarded the Design Excellence Award – CHICO, whose members included **JOSHUA MENDEZ**, **PRESTON MILLER**, and **FRANCISCO SUAREZ**, and Integrate and Image, with team members **AUSTIN COLLINS**, **NIKKA GHALILI (BME)**, **SHANNON GROVER (BME)**, and **CRAIG LABODA**. New to this year’s program, the Entrepreneurial Award was given to Team INTEGRATED IRRIGATION, made up of team members **KUAN CHEN**, **YUE FUNG CHOY**, **MICHAEL MOREIRA**, **TRACY THAI**, and **TIMOTHY WOLFE**.

Also announced at this year’s ECE Day was the Center for Space Physics Undergraduate Research Award, presented to **JOSHUA MENDEZ** and **GENEVIEVE PLANT**, and the Michael F. Ruane Award for Excellence in Senior Capstone

Design, given to **CRAIG LABODA**.

A Harold C. Case Scholarship, which recognizes juniors for academic excellence and service to Boston University, was given to **IDAN WARSAWSKI**.

SAMIR AHMED, **EVEGENI AIZENBERG**, and **KAM LAI** were awarded Kenneth R. Lutchen Distinguished Fellowships, designed to fund summer research projects that will have a societal impact.

CONNOR MCEWEN was a member of the winning team at the first annual Smart Lighting Challenge, which asked students to present the most compelling argument for the development, improvement, or deployment of the Green-Light Concept.

DAN COLLINS was a member of the first place team at Open Minds, a national video competition for teams of college inventors hosted by Inventors Digest and the National Collegiate Inventors and Innovators Alliance.

SAMIR AHMED, **ALEX CHAN**, and **ANNA EVANS** were chosen as College of Engineering Technology Innovation Scholars.



Samir Ahmed received a Kenneth R. Lutchen Distinguished Fellowship and was chosen as a College of Engineering Technology Innovation Scholar.

Undergraduate Courses

COURSE NUMBER	COURSE TITLE	FALL '10	SPRING '11	SUMMER '11
EC311	INTRO TO LOGIC DESIGN	Joshi	Densmore	
EC327	INTRO TO SOFTWARE ENGINEERING	Coskun	Trachtenberg	
EC330	APPLIED ALGORITHMS FOR ENGINEERS		Brower	
EC381	PROBABILITY THEORY IN ELECTRICAL AND COMPUTER ENGINEERING	Levitin	Levitin	
EC401	SIGNALS AND SYSTEMS	Carruthers	Ishwar	Carruthers
EC402	CONTROL SYSTEMS		Pisano	
EC410	INTRO TO ELECTRONICS	Knepper Horenstein	Freedman	Kleptsyn
EC412	ANALOG ELECTRONICS		Knepper	
EC413	COMPUTER ORGANIZATION	Herbordt		
EC415	COMMUNICATION SYSTEMS		Carruthers	
EC416	INTRO TO DIGITAL SIGNAL PROCESSING		Konrad	
EC440	INTRO TO OPERATING SYSTEMS		Galvin	
EC441	INTRO TO COMPUTER NETWORKING	Alanyali		
EC447	SOFTWARE DESIGN	Skinner		
EC450	MICROPROCESSORS	Giles	Giles	
EC455	ELECTROMAGNETIC SYSTEMS I	Lee		Lee
EC456	ELECTROMAGNETIC SYSTEMS II		Kotiuga	
EC463	SENIOR DESIGN PROJECT I	Pisano/Horenstein		
EC464	SENIOR DESIGN PROJECT II		Pisano/Montazam	
EC470	SENSORS IN SPACE		Fritz	
EC471	PHYSICS OF SEMICONDUCTOR DEVICES		Moustakas	
EC481	FUNDAMENTALS OF NANOMATERIALS AND NANOTECHNOLOGY	Altug		
EC500	HIGH PERFORMANCE PROGRAMMING WITH MULTICORE AND GPUS		Herbordt	
EC501	DYNAMICAL SYSTEMS THEORY	Baillieul		
EC504	ADVANCED DATA STRUCTURES	Starobinski		
EC505	STOCHASTIC PROCESSES	Karl	Saligrama	
EC512	ENTERPRISE CLIENT-SERVER SOFTWARE SYSTEMS DESIGN		Skinner	
EC513	COMPUTER ARCHITECTURE	Herbordt		
EC514	SIMULATION	Vakili		
EC515	DIGITAL COMMUNICATION	Ishwar		
EC516	DIGITAL SIGNAL PROCESSING	Nawab		
EC517	INTRO TO INFORMATION THEORY		Nazer	
EC518	SOFTWARE PROJECT MANAGEMENT		Brackett	

COURSE NUMBER	COURSE TITLE	FALL '10	SPRING '11	SUMMER '11
EC520	DIGITAL IMAGE PROCESSING AND COMMUNICATION	Konrad		
EC524	OPTIMAZATION THEORY AND METHODS	Castañón		
EC533	ADVANCED DISCRETE MATHEMATICS	Levitin		
EC535	INTRO TO EMBEDDED SYSTEMS		Coskun	
EC541	COMPUTER COMMUNICATIONS AND NETWORKS		Alanyali	
EC543	SUSTAINABLE POWER SYSTEMS: PLANNING, OPERATION AND MARKETS	Caramanis	Caramanis	
EC544	NETWORKING THE PHYSICAL WORLD	Little		
EC551	ADVANCED DIGITAL DESIGN WITH VERILOG AND FPGA	Van Court		
EC560	INTRO TO PHOTONICS	Dal Negro	Altug	
EC561	ERROR CONTROL CODES		Karpovsky	
EC566	THE ATMOSPHERE AND SPACE ENVIRONMENT	Oliver		
EC568	OPTICAL FIBERS AND WAVEGUIDES	Ramachandran		
EC570	LASERS		Teich	
EC571	VLSI PRINCIPLES AND APPLICATIONS	Hubbard	Hubbard	
EC573	SOLAR ENERGY SYSTEMS		Mazumder	
EC574	PHYSICS AND SEMICONDUCTOR MATERIALS	Bellotti		
EC575	SEMICONDUCTOR DEVICES		Bellotti	
EC577	ELECTRICAL, OPTICAL, AND MAGNETIC PROPERTIES OF MATERIALS	Moustakas		
EC578	FABRICATION TECHNOLOGY FOR INTEGRATED CIRCUITS	Kleptsyn		
EC579	MICROELECTRIC DEVICE MANUFACTURING		Cole	
EC580	MODERN ACTIVE CIRCUIT DESIGN	Knepper		
EC582	RF/ANALOG IC DESIGN FUNDAMENTALS		Knepper	
EC591	PHOTONICS LAB I	Paiella		
EK131/132	INTRODUCTION TO ENGINEERING	Swan Kotiuga Trachtenberg Giles	Swan Starobinski Borogovac	
EK307	ELECTRIC CIRCUIT THEORY	Carruthers	Semeter Lee Swan	Carruthers
EK501	MATHEMATICAL METHODS I	Kotiuga		
MET EK317	ELECTRIC CIRCUIT THEORY I	Lee		
MET EK318	ELECTRIC CIRCUIT THEORY II		Lee	

Instructional Laboratories

Control Systems Laboratory

Faculty: Pisano

This laboratory houses four ECP model 220 Industrial Plant Emulators for studying the control of practical systems. These systems consist of an electromechanical apparatus including an adjustable mechanical mechanism (plant) with actuators and sensors. Various types of controllers (e.g. PID, State Feedback, LQR) can be designed and implemented in either continuous or discrete time formulations using a DSP-based real-time controller with a Windows graphical interface. Non-ideal conditions that are often present in real-world applications can be studied. Integrated with the systems are MATLAB and SIMULINK design tools, which can be used to design control systems that can then be implemented in the hardware. Analytical models of both the “plant” and the “controller” can be validated with actual hardware responses.

Electronic Design Automation & VLSI Laboratory

Faculty: Hubbard, Knepper

The VLSI Laboratory is involved in almost all aspects of digital design. It has a wide range of CAD tools available for student use, including Cadence, Synopsys, and the NCSU Design Toolkit.

Flexible Project Lab

Faculty: Pisano

Flexible Project Lab is available to senior design teams, student clubs, and other projects supporting the ECE department’s educational mission.

High Performance Computing Laboratory

Faculty: Brower, Giles

The High Performance Computing Laboratory at Boston University was created with support from the National Science Foundation (NSF) in order to support the development of undergraduate courses in parallel and high performance computing. The courses offered at Boston University serve as a national model for computational science education. The lab features a network of multimedia graphics workstations linked at high speed to the supercomputers at the Center for Computational Science and the Scientific Computing and Visualization Lab.

Microprocessor and PC Laboratory

Faculty: Trachtenberg

This lab features instruction in the programming and interfacing

of microcomputers and digital controllers. Higher-level courses emphasize the design of systems using microprocessors. Various simulators, and analysis packages are available.

Senior Project Laboratory

Faculty: Ruane, Knepper, Kia, Pisano

The Senior Project Lab supports senior design teams, serving real-world corporate customers such as Analog Devices, government agencies like NASA, community groups like Boston public schools, social service agencies, artists, and small businesses, as well as faculty and staff across the University. Each team has 24/7 access to a permanent bench setup with a networked Pentium PC, benchtop Agilent test equipment, and CAD software for schematic entry, simulation, PCB layout and mechanical design. Electronics assembly and machine shop support is provided. Shared tools include high speed scopes, logic analyzers, spectrum analyzers, E-prom, PLA and FPGA burners, and various compilers and cross-compilers for FPGA, DSP and microcontroller development. Software from MSDNAA is available for all teams.

Signals and Networks (SIGNET) Laboratory

Faculty: Alanyali, Carruthers, Konrad, Karl, Starobinski, Trachtenberg

This laboratory provides instructional facilities for courses in the areas of signal processing and communication networks. This laboratory houses numerous workstations for digital signal processing, image processing, and various real-time applications covering the complete audio frequency spectrum. Equipment includes Linux-based workstations, microphones, DSP boards, speakers, amplifiers and software packages such as MATLAB. On the communications side, experiments involving data communication links, local-area networks, and wide-area networks are supported. Powerful computer-based simulation and analysis tools are available to compare and evaluate network designs. Facilities are also provided with a new dedicated network lab.

Software Engineering Laboratory

Faculty: Brackett, Konrad, Giles, Joshi

An instructional and research lab, the Software Engineering Laboratory (SEL) supports courses and research on the economical design of reliable software for large-scale and embedded computer-based systems. The laboratory provides students with state-of-the-art workstations for the design, implementation, and testing of software and programmable hardware. There is a

Private LAN for developing network protocols or testing embedded systems.

Smart Lighting Undergraduate Research Program (SLURP) Laboratory

Faculty: Little

The mission and focus of the former High Tech & Toys Laboratory (HTTTL) was reorganized to address educational needs for the Smart Lighting ERC. This lab is now equipped with ten contemporary workstations, a mechanical shop area, and a lighting cage compatible with the Communications Testbed at BU. A variety of research engaging undergraduates can be completed in this facility which serves as a persistent lab space for experimenting with and designing the next generation of lighting, biosensing, and communications projects.

INSTRUCTIONAL LAB EXPENDITURES

	<i>Approx. Cost</i>
Microcomputer and Software Engineering Labs	\$4,425.08
VLSI and Signals/Networks Lab	\$25,396.91
Electronics Lab	\$69,305.02
High Powered Computing Lab	\$15,536.75
Photonics Lab	\$8,172.52
Senior Projects Lab	\$3,351.98
Other (includes materials and equipment for courses not assigned to a specific lab)	\$2,257.59
Total	\$128,445.85

2011 ECE Award for Excellence in Teaching

Professor **JANUSZ KONRAD** was the winner of the 2011 ECE Award for Excellence in Teaching. He received the award for his outstanding record of teaching: from an introduction to engineering module EK131 on multimedia computing and communications to EC416, a course on digital signal processing, in addition to graduate courses in the field.

The Department instituted this award during the 1997-98 academic year to recognize innovation and excellence in teaching among its faculty. The award, based on nominations from College of Engineering students, faculty, and staff, carries with it a \$1,000 prize to be used toward instructional activities. A committee of ECE professors and students evaluate the nominees, using teaching statements, classroom material, and student comments.



IEEE Student Branch

This year, the ECE supported Boston University student chapter of the IEEE was under the direction of President Joshua Mendez, Vice President Eulalia Moreno, and Secretary William Anthony

(see blogs.bu.edu/ieee). In addition to tutoring and a variety of social events, the BU IEEE chapter hosted the IEEE Region 1 Student Conference on March 26-27, 2011.

Senior Design

All ECE seniors complete a team-based, two semester capstone senior design project. Teams must design and prototype a product, electronic device, or software system for real-life customers, who are drawn from industry, small businesses, community groups, and faculty and staff. Students learn design methods, project management, team dynamics, communication skills, and legal and ethical standards for design. A substantial first-deliverable milestone and oral presentation complete the first semester.

The second semester is spent in the Senior Project Laboratory. Students must make presentations to their customer, write inter- and intra-office memos, design their project to meet customer specifications, manage the project budget, and deliver their working prototype, including a detailed instruction manual. Project records are maintained in personal design log-books. Teams have 24/7 access to their fully-equipped laboratory bench and can use professional CAD and prototyping tools for circuits, embedded systems, and software development. The

year culminates in student project presentations on ECE Day to faculty, industry representatives, and fellow students. On May 9, 2011, 14 teams presented their projects and Team GloveSense was awarded the top prize, the P.T. Hsu Outstanding Senior Design Project award.



Notable Senior Design Projects

GloveSense

For firefighters who risk their lives to save someone from a burning building or police officers involved in a standoff with a shooter, communicating without speaking is necessary – if not essential – to their line of work. Unfortunately, poor communication remains a problem in these jobs.

According to a recent US Homeland Security Report, “inadequate communication has a definite negative impact on the safety of emergency personnel and may contribute to injuries or deaths of firefighters, rescue workers, and civilians.”

As part of their Senior Design Project, Luke Anderson, Anna Evans, Patrick Henson, Jonathan Kwan, and Angelo Luo, all members of Team GloveSense, hoped to be a part of the solution.

The team worked with customer Lesley Yu of National Instruments to create a smart glove for first responder communication that allows firefighters and other emergency personnel to communicate through non-verbal gestures.

“As they risk their lives for public safety, an emphasis must be placed on their communication roles,” said Luo. “We believe that there is a dire need for a more effective means of communication.”

Their efforts paid off when GloveSense took home the top prize, the P. T. Hsu Outstanding Senior Design Project, at ECE Day '11.



The team’s device, which consists of a motion capturing glove, microprocessor for signal processing, and wireless output, functions as an electronic communication system and can recognize a large library of gestures that can be expanded using its LabVIEW software interface.

“Our device, GloveSense, extends the use of existing hand gestures, a fast and reliable communication system, beyond visible and audible range,” the teammates wrote in their project description.

INTEGRATED IRRIGATION

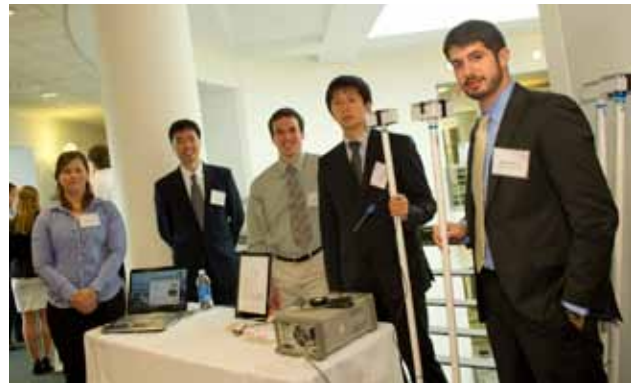
Nowadays having a beautiful lawn doesn't mean you have to spend your weekends working in a yard thanks to automatic water sprinklers. Unfortunately, some of these sprinklers can waste water – bad for both the environment and monthly bills.

As part of their Senior Design Project, Team iNTEGRATED iRRIGATION, made up of seniors Kuan Chen, Yue Fung Choy, Michael Moreira, Tracy Thai, and Timothy Wolfe, designed a smart garden watering system to improve the efficiency of these automatic sprinklers.

They worked with customer, Isabel Pisano, of Oracle to come up with a system that measures environmental conditions and automatically takes action based on collected data and user specifications.

Said Wolfe: "This project helped me prepare for the real world by putting into practice skills like working on a team and dealing with high pressure deadlines on difficult problems."

iNTEGRATED iRRIGATION accomplished their task by creating a wireless sensor system that sends data to a central computer. The system then turns on the sprinkler based on decisions made by the algorithm that uses information from past data, present measurements, and future weather forecasts.



"The user will then be able to access the information by text or e-mail," Moreira said.

The project caught the eyes of judges at ECE Day '11, and the team took home the Entrepreneurial Award, new to 2011.

Since winning the prize in May, the system has been installed in Pisano's yard, and some of the team members even had a chance to witness the results.

Wolfe said: "When you get to visit your customer's home and see things transmitting from inside a building to a real garden in the woods, it reminds you why you worked so hard to pursue engineering as a field of study."

CHICO

Millions of dollars in space hardware are lost each year as a result of unexpected conditions in the highest portions of the Earth's atmosphere and magnetosphere. Often times, activities on the solar surface such as coronal mass ejections can result in the destruction of orbiting spacecraft.

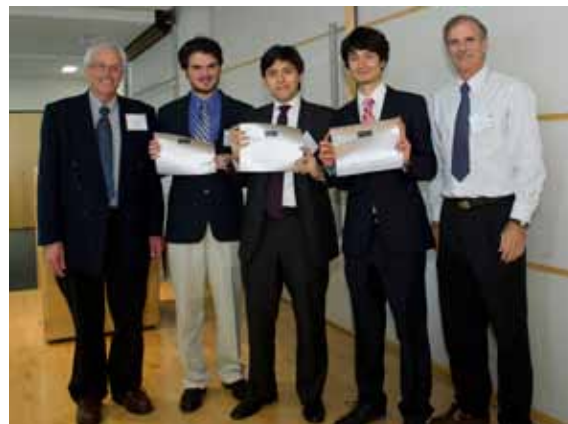
To combat this problem, Joshua Mendez, Preston Miller, and Francisco Suarez, designed a compact half-unit imaging electron spectrometer for CubeSat operations – known as CHICO for short – for their senior design project.

Team CHICO aimed to provide a cost-effective, miniaturized Imaging Electron Spectrometer (IES) to combat space-weather. Impressed by their efforts, the judges at ECE Day '11 awarded them the Design Excellence Award.

Designed around the Readout Electronics for Nuclear Applications (RENA3) chip and a Zilinx FPGA, the team's instrument measures particle flux as its host satellite or other satellites pass by.

"Our device will pick up collisions and know how and where the satellite is moving," said Miller.

Despite its relatively small size – CHICO occupies a volume no larger than 500 cm³ – it is expected to possess impressive energy and angular resolution for energetic electrons.



Throughout their research, the seniors worked closely with their customer, Professor Theodore Fritz (CAS). Collaborating with a client on the project gave the students a chance to gain real-world experience and work with someone outside of Boston University's Department of Electrical & Computer Engineering (ECE).

"Ultimately, our final product was the result of a collaboration between ECE, mechanical engineering, and physics," said Mendez.

Integrate and Image (BME-ECE Interdisciplinary Team)

It happens to so many patients. Feeling sick, they visit the doctor to find out what's wrong, but then they have to wait a day or more on results.

As part of their Senior Design Project, Austin Collins (ECE), Nikka Ghalili (BME), Shannon Grover (BME), and Craig LaBoda (ECE) opted to look at how disease detection could be improved.

As members of the team, Integrate and Image, the seniors worked toward providing the groundwork research for a microfluidic label-free infectious disease diagnostic platform. Specifically, they looked at how label-free imaging and fluorescent imaging could be used to detect Influenza A.

In disease detection, DNA is typically tagged with a fluorescent label. Though this imaging is sensitive, Integrate and Image believed that combining that method with the label-free Interferometric Reflectance Imaging Sensor (IRIS) could provide more specific information about the Influenza A sample than fluorescent imaging alone.

With their game plan in mind, this then led to the next step of the project – designing a Si-SiO₂ substrate that can accommodate both imaging techniques.

“We had to determine a silicon dioxide thickness that will work with both label-free imaging and fluorescent imaging,” said Collins. This would then allow the quantitative power of IRIS to be harnessed with the sensitivity of IRIS.

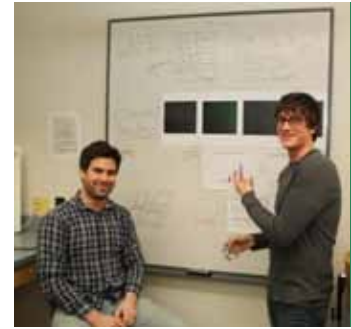
After fabricating the chips in Boston University's clean room and running experiments and simulations with both imaging

techniques, the team is happy to report that they have found success. They hope to publish a paper containing their results in the near future.

Integrate and Image was one of two interdisciplinary teams this year, with electrical & computer engineering students working side-by-side with biomedical engineering majors. As their customers, Professors Catherine Klapperich (BME, ME) and Selim Ünlü (ECE), were also collaborating across the two fields.

“As a multidisciplinary team, our research project gave us a challenging yet exciting opportunity to widen our breadth of engineering knowledge,” LaBoda said. “In a world where drawing the line between different fields can be difficult, I believe an experience such as this exposes you to what's out there, broadening your job possibilities and providing you with an upper-hand in the real world.”

Though the seniors' main goal was to provide initial evidence on the outcome of using label-free imaging in disease detection, they have high hopes for their research. They wrote in their project description: “In the future, the presented research can be integrated into a single microfluidic ‘lab-on-a-chip’ platform which can be used as a point of care diagnostic device.”



BUSAT

Undergraduates, graduate students and faculty working on Boston University Student-Satellite for Application and Training (BUSAT), a comprehensive satellite project, continue to work toward improving space weather forecasting. The effort is funded by the University Nanosat Program (UNP), which is jointly run by the Air Force Office of Scientific Research (AFOSR), the Air Force Research Laboratory's Space Vehicles Directorate, and the American Institute of Aeronautics and Astronautics. The project has already involved over 70 undergraduate students, 15 graduate students, and four faculty members from three departments.

During Summer 2011, 24 BU students worked toward developing a space weather satellite that will be entered in an eleven-university competition judged by the US Air Force (USAF) in January 2013. The winning satellite will be flown by the USAF after an additional two years of flight fabrication, testing, and qualification.

A satellite ground station is being installed on the roof of the Photonics Building to permit the commanding of the satellite on-orbit and the reception of data from the satellite. The PI on the project, Professor Theodore Fritz (ECE/CAS), brings to the project nearly 50 years of experience in spacecraft and satellite instrument design.

Also this summer as part of the BUSAT effort, the Near-Space Education Program was launched at the MATCH Charter Public High School. Taught by BU undergraduates, high school students learned about the near-earth space environment and how to build sensor systems to measure temperature and pressure at high altitudes. This led to the successful launch of a weather balloon with instruments from Mount Greylock in western Massachusetts.

Graduate Program

Recruitment

Five new PhD students were awarded the Dean's Fellowships (DF's) and matriculated in Fall 2010. These students will be continuing their degree programs and are making excellent progress. Seventeen new PhD students matriculated with Graduate Teaching Fellowships (GTFs) in the same period; fourteen of these students were offered Research Assistantships (RAs) for the Fall 2011 semester.

With respect to degree production, 42 and 30 students graduated with the MS and PhD degrees, respectively, during the report period. The breakdown by degree is: 52 in EE, 19 in CE and 1 in Photonics.

We experienced an excellent recruiting year for Fall 2011

admissions. After receiving more than 1000 applicants to the program, we expect an incoming class of 45 MS students, 35 MEng students and 22 PhD students. With respect to fellowships and assistantships, we will be matriculating 21 new funded graduate students for the Fall 2011 semester: three Dean's Fellows, 22 ECE Fellows, and one Photonics Fellow.

These numbers indicate a significant increase in the number of applicants, yield on fellowship offers, and the overall quality of the fall matriculants. This continues the trend of securing a class of funded students of increasing quality amidst a growing pool of candidates interested in our degree programs in ECE.

NEW MATRICULANTS 2010-2011

		Male	Female	Full-Time	Part-Time	ECE Fellows	DF
MS	US	22	0	19	3	1	0
	Intl.	47	7	54	0	2	0
PHD	US	10	1	11	0	8	3
	Intl.	11	3	14	0	11	2
Total		90	11	98	3	22	5

FALL 2010 MEAN GRE SCORES

	Verbal	%	Quantitative	%	An. Writing	%
MS	469	52	771	87	3.5	25
PHD	464	51	773	88	3.5	26
Mean	467	52	772	88	3.5	26

SPRING 2011 MEAN GRE SCORES

	Verbal	%	Quantitative	%	An. Writing	%
MS	451	47	740	79.9	3.4	25.7
PHD	399	33.3	764	85.6	3.0	15.6
Mean	425	40.2	752	82.8	3.2	20.7

Graduate Enrollment

MS Degree Enrollment

PROGRAM	ENROLLMENT
Computer Engineering	14
Computer Systems	5
Electrical Engineering	87
Photonics	5
Total	111

PhD Degree Enrollment

PROGRAM	ENROLLMENT
Computer Engineering	13
Electrical Engineering	89
Photonics	0
Total	102

Graduate Degrees

MS Degrees Awarded

PROGRAM	DEGREES
Computer Engineering	5
Computer Systems Engineering	8
Electrical Engineering	26
Photonics	1
Total	42

PhD Degrees Awarded

PROGRAM	DEGREES
Computer Engineering	4
Electrical Engineering	17
Total	21

Course and Program Development

The ECE Department continues to refine the graduate curriculum, with two new courses developed and offered during 2010-2011. In addition, two courses that were developed as special topics were approved to become part of the regular curriculum and were assigned course numbers.

In Fall 2010, EC500: CyberSecurity, was developed by Professors Starobinski and Trachtenberg as a Special Topics Course and is scheduled to be taught in Fall 2011.

The ECE Graduate Committee also approved a "Teaching Practicum" course (EC801/802) as part of a new requirement for all PhD students to gain practical teaching experience for at

least two semesters in their program, at a time coordinated with the department and the student's advisor.

The department has also introduced a new ECE fellowship that provides first-year support for some incoming PhD students.

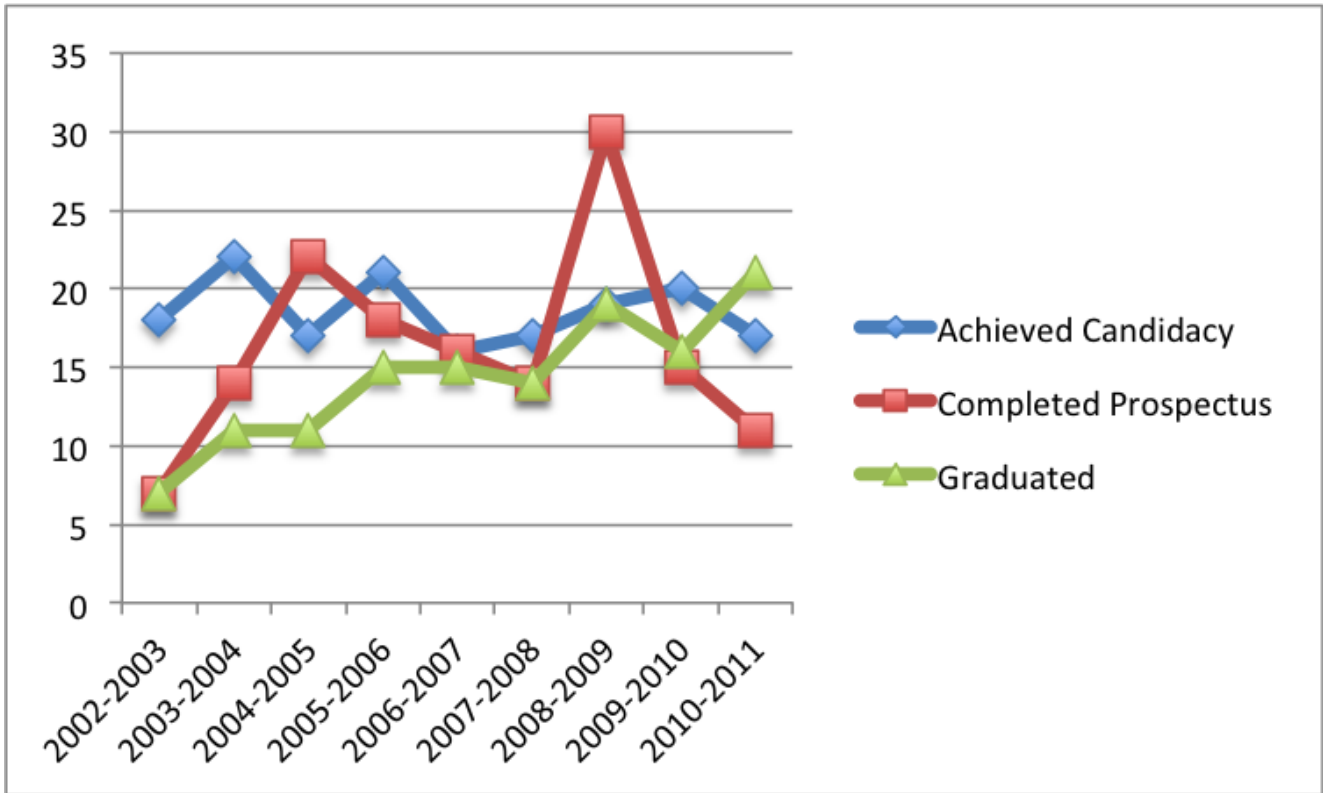
During the year, two other courses that were originally developed as special topics courses (EC500 and EC700) were given course numbers and entered into the course inventory:

- » EC583 - Power Electronics
- » EC527 - Performance Programming with Multicore and GPUs

PhD Student Progress

The number of PhD graduates per year is an important measure of the strength of the graduate programs. In prior years, we saw the results of the procedural improvements to keep the progress of the PhD students on track. Our requirement that students must pass the PhD prospectus within two years of PhD candi-

dacy is intended to guide the students to identify dissertation topics, focus on their research, and reach their degrees in a timely manner. The chart below shows the number of PhD students achieving candidacy, completing their prospectus defense, and graduating over the last nine academic years.



Graduate Teaching Fellows and Research Assistants

	SUMMER 2010	FALL 2010	SPRING 2011	TOTAL
Graduate Teaching Fellows	4	18	18	40
Research Assistants	83	82	67	232

PhD Dissertations

STUDENT NAME	DISSERTATION ADVISOR	DISSERTATION TITLE
Gilberto Basilio-Sanchez	Theodore Morse	The Fiber Optic Pump Loop Combiner: A Novel Pump Combiner for HOM (High Order Modes) High Power in Fiber Optic Lasers
Shihchin Chiu	Martin Herbordt	Accelerating Molecular Dynamics Simulations with High Performance Reconfigurable Systems
Paul DeBitetto	David Castañón	Robust Hierarchical Image-Augmented Navigation in Urban Terrain with 3D Landmarks
Niloofar Fazlollahi	David Starobinski	Resource Management Algorithms for Advanced Networking Applications
Song Guo	Thomas Little	Enabling Video Delivery Over Wireless Sensor Networks
Xiang He	Theodore Fritz	A Multi-Channel Integrated ReadOut Circuit (MIROC) Chip for Solid State Charged Particle Detectors
Michael Klida	Theodore Fritz	Origin and Evolution of Energetic Particle Populations in the Magnetosphere
Rohit Kumar	David Castañón	Efficient Tracking of Public Transit in an Urban Environment
Yitao Liao	Theodore Moustakas	Development of Efficient Deep Ultraviolet Light Emitting Diodes
Nan Ma	Prakash Ishwar	Interactive Source Coding for Function Computation in Networks
Michele Moresco	Anna Swan	Advanced Theory of High Field Carrier Transport in Semiconductors with Application to the Study of Avalanche Photodiodes
Charles Parker	Theodore Fritz	The Design and Implementation of a High Sensitivity Telescope for In Situ Measurements of Energetic Particles in the Earth's Radiation Belts
Yirong Pu	Allyn Hubbard	Biomimetic Spike-Based Approaches to Enhance Transient Sound Classification and Localization and Speech Recognition
Andrea Rosales-Garcia	Theodore Morse	Polarization Mode Beating Techniques for High Sensitivity Intracavity Sensing
Mohammed Saleh	Bahaa Saleh	Second-Order Parametric Interactions in Multi-Layered Media and Multi-Mode Waveguides
David Simon	Alexander Sergienko	Applications of Correlation and Quantum Entanglement to Optical Measurement
Bharat Sukhwani	Martin Herbordt	Accelerating Molecular Docking and Binding Site Mapping Using FPGAs and GPUs
Vyas Venkatarama	Wei Qin	LYRA: A High Level Modeling and Synthesis Methodology for Concurrent Systems Using Rendezvous
Ye Wang	Prakash Ishwar	Secure Computation and Inference in Networks: Performance Limits and Efficient Protocols
Zhen Wang	Mark Karpovsky	Nonlinear Robust Codes and Their Applications for Design of Reliable and Secure Devices
Selcuk Yerci	Luca Dal Negro	Erbium-Doped Silicon Nitride for On-Chip Photonics Applications
Manqi Zhao	Venkatesh Saligrama	Role of Sparsity in Signal Detection and Estimation

Graduate Courses

COURSE NUMBER AND TITLE		FALL '10	SPRING '11	SUMMER '11
EC500	HIGH PERFORMANCE PROGRAMMING WITH MULTI-CORE AND GPUS		Herbordt	
EC501	DYNAMICAL SYSTEMS THEORY	Baillieul		
EC504	ADVANCED DATA STRUCTURES	Starobinski		
EC505	STOCHASTIC PROCESSES	Karl	Saligrama	
EC512	ENTERPRISE CLIENT-SERVER SOFTWARE SYSTEMS DESIGN		Skinner	
EC513	COMPUTER ARCHITECTURE	Herbordt		
EC514	SIMULATION	Vakili		
EC515	DIGITAL COMMUNICATION	Ishwar		
EC516	DIGITAL SIGNAL PROCESSING	Nawab		
EC517	INTRODUCTION OF INFORMATION THEORY		Nazer	
EC518	SOFTWARE PROJECT MANAGEMENT		Brackett	
EC520	DIGITAL IMAGE PROCESSING AND COMMUNICATION	Konrad		
EC524	OPTIMIZATION THEORY AND METHODS	Castañón		
EC533	ADVANCED DISCRETE MATHEMATICS	Levitin		
EC535	INTRODUCTION TO EMBEDDED SYSTEMS		Coskun	
EC541	COMPUTER COMMUNICATION NETWORKS		Alanyali	
EC543	SUSTAINABLE POWER SYSTEMS: PLANNING, OPERATION, AND MARKETS	Caramanis	Caramanis	
EC544	NETWORKING THE PHYSICAL WORLD	Little		
EC551	ADVANCED DIGITAL DESIGN WITH VERILOG AND FPGA	Van Court		
EC560	INTRODUCTION TO PHOTONICS	Dal Negro	Altug	
EC561	ERROR-CONTROL CODES		Karpovsky	
EC566	THE ATMOSPHERE AND SPACE ENVIRONMENT	Oliver		
EC568	OPTICAL FIBERS AND WAVEGUIDES	Ramachandran		
EC570	LASERS		Teich	
EC571	VLSI PRINCIPLES AND APPLICATIONS	Hubbard	Hubbard	
EC573	SOLAR ENERGY SYSTEMS		Mazumder	
EC574	PHYSICS AND SEMICONDUCTOR MATERIALS	Bellotti		
EC575	SEMICONDUCTOR DEVICES		Bellotti	
EC577	ELECTRICAL, OPTICAL, AND MAGNETIC PROPERTIES OF MATERIALS	Moustakas		
EC578	FABRICATION TECHNOLOGY FOR INTEGRATED CIRCUITS	Kleptsyn		
EC579	MICROELECTRONIC DEVICE MANUFACTURING		Cole	
EC580	MODERN ACTIVE CIRCUIT DESIGN	Knepper		

COURSE NUMBER AND TITLE		FALL '10	SPRING '11	SUMMER '11
EC582	RF/ANALOG IC DESIGN FUNDAMENTALS		Knepper	
EC591	PHOTONICS LAB I	Paiella		
EC710	DYNAMIC PROGRAMMING AND STOCHASTIC CONTROL		Caramanis	
EC716	ADVANCED DIGITAL SIGNAL PROCESSING		Nawab	
EC717	IMAGE RECONSTRUCTION AND RESTORATION		Karl	
EC719	STATISTICAL PATTERN RECOGNITION	Saligrama		
EC724	ADVANCED OPTIMIZATION THEORY AND METHODS		Paschalidis	
EC728	DESIGN AND TESTING FOR DISTRIBUTED SOFTWARE: INTENSIVE SYSTEMS	Brackett		
EC730	INFORMATION-THEORETICAL DESIGN OF ALGORITHMS		Levitin	
EC733	DISCRETE EVENT AND HYBRID SYSTEMS		Cassandras	
EC734	HYBRID SYSTEMS	Belta		
EC757	ADVANCED MICROPROCESSOR DESIGN			Montazam
EC763	NONLINEAR AND ULTRAFAST OPTICS	Teich		
EC771	PHYSICS OF COMPOUND SEMICONDUCTOR DEVICES	Bellotti		
EC772	VLSI GRADUATE DESIGN PROJECT		Joshi	
EC777	NANO-OPTICS		Dal Negro	
EC782	RF/ANALOG IC DESIGN ADVANCED APPLICATIONS	Knepper		
EK501	MATHEMATICAL METHODS I	Kotiuga		

The MS Project Symposia gave graduate students a chance to present their research to peers and faculty.



Instructional Laboratories

Cyber Security Laboratory

Faculty: Starobinski, Trachtenberg

The Cyber Security Laboratory enables security assessment and penetration testing of wireline and wireless networks. Workstations in the lab run the BackTrack Linux distribution which re-groups hundreds of utilities for information gathering, network mapping, password cracking, privilege escalation, and digital forensics, including Wireshark, a versatile packet sniffer, and ettercap, a suite for man-in-the-middle attacks. BackTrack Linux also includes several utilities targeting wireless networks, e.g., Kismet, an IEEE 802.11 layer 2 wireless network detector, sniffer and intrusion detection system.

Image and Multidimensional Signal Processing Laboratory (IMSIP)

Faculty: Karl, Konrad

This laboratory serves graduate instructional needs of the department in the areas of multidimensional signal processing (including image and video processing), statistical signal processing, pattern recognition, as well as earth and space sciences. The laboratory provides advanced computational resources and associated software packages. Fast, dual processor workstations connected through a gigabit network form a computational backbone while high-capacity monochrome and color printers serve the hardcopy needs. State-of-the-art processing and optimization software is available. This laboratory was developed with funds from the National Science Foundation, and is currently being upgraded with departmental funds.

Photonics Laboratory

Faculty: Altug, Bigio, Morse, Paiella, Swan, Teich, Ünlü

The Photonics Instructional Laboratory supports introductory and intermediate level courses in the MS in Photonics program. Four stations each have a vibration isolated optical table, HeNe and semiconductor lasers, fiber components and systems, electronic test equipment, and GPIB-connected PCs for LabVIEW data logging and instrument control. Shared equipment exists for experiments and demonstrations in interferometry, spectrometry, diffraction, holography, acoustic and electro-optic modulation, and optical spectrum analysis. A secure annex room houses two additional isolated tables, electronics and optical equipment to support thesis and senior design projects that require long-term setup of apparatus.

ECE Colloquia & Seminars

The Colloquium and Seminar series continued for another successful year, and, now in its second year, the **Distinguished Lecture Series** (noted in **bold**) also continued to offer a set of high-profile lectures by some of the brightest luminaries in electrical

and computer engineering. Prominent speakers from inside and outside the University delivered engaging research talks on current issues to graduate students, faculty, and other students and guests from the greater Boston area.

DATE	SPEAKER	TITLE
7/16/10	Vasily Astratov University of North Carolina, Charlotte	Fundamentals and Applications of Microsphere Resonator Arrays
8/2/2010	Yaron Bromberg Weizmann Institute of Science, Israel	Quantum Inspired Imaging With Compressive Sensing
8/10/2010	Martin Moskovitz University of California, Santa Barbara	Transforming SERS Into a Reliable, Ultra-Sensitive Analysis Tool
9/15/2010	Sheila Hemami Cornell University	Talk-Based Imaging - Quantifying Usefulness and Its Relationship to Image Quality**
9/29/2010	Shih-Fu Chang Columbia University	Visual Search: State of the Art and Open Issues
10/13/2009	Stefano Soatto University of California, Los Angeles	Shannon Meets Gibson: Actionable Information and the Link Between Vision and Control**
10/20/2010	Mark A. Horowitz Stanford University	Encapsulating Designer Knowledge: Improving Digital and Mixed Signal Design
10/27/2010	Robert M. Gray Stanford University	Simulation and Source Coding**
10/29/2010	Shahraam Afshar University of Adelaide	The World is More Non Linear Than We Think! Nonlinear Processes in High Index Subwavelength Fibers: (Revising Fundamentals, Materials and Fabrications, and Applications)
11/10/2010	Khalil Najafi University of Michigan	Biomedical Wireless Integrated Microsystems (BioWIMS)
11/11/2010	Jacob Chakareski Swiss Federal Institute of Technology (EPFL)	Towards the Convergent Networks of the Future - Social Media Computing, Inc.
11/17/2010	Faith Porikli Mitsubishi Electric Research Laboratory	Learning on Manifolds**
11/18/2010	Ramji Venkataramanan Yale University	Interactive Codes for Synchronization
11/29/2010	Koray Aydin California Institute of Technology	Extending the Photonics Toolbox with Plasmonic Super Absorbers and Active Optical Metamaterials
12/1/2010	Iris Bahar Brown University	Online Error Detection Using Invariant Relationships**
12/8/2010	Sherief Reda Brown University	Addressing the Thermal and Power Challenges of Tera-Scale Computing
12/8/2010	Stanley H. Chan University of California, San Diego	Challenges in Processing 3D Videos
1/19/2011	John Wright Visual Computing Group Microsoft Research	Robust Analysis of High-Dimensional Data
1/20/2011	Arnand Sarwate University of California, San Diego	Learning from Sensitive Data: Balancing Accuracy and Privacy

DATE	SPEAKER	TITLE
1/26/2011	Rajesh K. Gupta University of California, San Diego	The Variability Expeditions: Exploring the Software Stack for Under-Designed Computing Machines
1/31/2011	Dr. Jeffrey Kash IBM, Thomas J. Watson Research Center	Optical Interconnects in Exascale Supercomputers
2/16/2011	Nick Bowen IBM	Technology Disruptions and Trends: The Next Decade
2/23/2011	Hariharan Narayanan MIT	Testing the Manifold Hypothesis
2/28/2011	Seth Hutchinson University of Illinois at Urbana-Champaign	Partitioned and Hybrid Methods for Visual Servo Control
3/2/2011	Mark J. T. Smith Purdue University	Improved Models for Accent Detection and Voice Synthesis
3/7/2011	Brian Kulis University of California, Berkeley	Learning for Search and Adaptation in Large-Scale Data
3/9/2011	Ethan Katz-Bassett University of Washington	Improving Internet Performance and Availability with Reverse Traceroute
3/10/2011	Venu Veeravalli University of Illinois at Urbana-Champaign	Distributed Inference in Wireless Sensor Networks**
3/18/2011	Allen Tannenbaum Georgia Institute of Technology	Controlled Active Vision/Image Processing with Various Applications
3/23/2011	David Albonesi Cornell University	Nanophotonic Interconnect Architectures for Many-Core Microprocessors**
3/28/2011	Alex Shye Qualcomm Bay Area Research & Development Center	Power to the People: Incorporating the End User in Mobile Architecture Research
4/4/2011	Nirah K. Jha Princeton University	Bridging the ASIC/FPGA Gap with NATURE: A Fine-Grain Dynamically Reconfigurable Architecture**
4/6/2011	Antonio Ortega University of Southern California	Wavelets on Graphs: Theory and Application**
4/15/2011	Yogesh B. Gianchandani University of Michigan	Emerging Research in Microsystems: Opportunities and Challenges for Societal Impact
4/19/2011	Odile Liboiron-Ladouceur McGill University	Energy-Efficient Optical Interconnects in Computing Platforms
4/20/2011	Urs Niesen Bell Laboratories, Alcatel-Lucent	The Degrees of Freedom of Compute-and-Forward
4/21/2011	Daniel W. Bliss The Advance Sensor Techniques Group, MIT Lincoln Laboratory	MIMO Wireless Communication with Applications to Ad Hoc Networks
4/27/2011	Pier Luigi Dragotti Imperial College, London	On the Sampling and Compression of the Plenoptic Function
4/28/2011	Hesham El Gamal Ohio State University	Proactive Mobile Content Distribution: Theory and Practice
5/4/2011	Moti Freiman Computation Radiology Laboratory Children's Hospital Boston	Computational Radiology of the Abdomen: From Volumetric Measurements to Quantitative Imaging Biomarkers
5/16/2011	Hans-Erik Nilsson Mid-Sweden University	Printed Wireless Sensor Solutions

DATE	SPEAKER	TITLE
5/19/2011	Hatice Altug Boston University	Metamaterials, Nanoplasmonics, and Nanofluidics for Ultra-sensitive Spectroscopy and Biodetection
5/27/2011	Russell D. Dupuis Georgia Institute of Technology	Advances in the MOCVD Growth of III-V Optical and Electronic Devices
6/30/2011	Christian Conrad University of Frankfurt	Learning Multi-View Correspondences from Temporal Coincidences

**ECE Colloquium Series



Stanford Professor Mark Horowitz takes questions from the audience after a Distinguished Lecture.

ECE-Affiliated Colloquia & Seminars

DATE	SPEAKER	TITLE	SPONSOR
9/17/2010	Justin Romberg Georgia Institute of Technology	An Overview of Compressed Sensing and Application to Two Localization Problems	CISE
9/24/2010	Devavrat Shah Massachusetts Institute of Technology	Message Passing Networks	CISE
10/1/2010	Jerry Zhu University of Wisconsin-Madison	Is Machine Learning the Wrong Name?	CISE
10/8/2010	Sean P. Meyn University of Illinois at Urbana-Champaign	Dynamic Models for Electric Power Markets	CISE
10/14/2010	Tara Javidi University of California, San Diego	Opportunistic Routing in Wireless Multihop Networks	CISE
10/15/2010	Ayse Coskun Boston University	Energy-Efficient Temperature Management for High Performance Multiprocessor Systems	CISE
10/15/2010	Joseph M. DeSimone University of North Carolina at Chapel Hill and North Carolina State University	Co-Opting Moore's Law: Vaccines, Medicines and Biological Particles Made on a Wafer	MSE
10/21/2010	Daniel Abramovitch Agilent Laboratories	How Not to Present Your Work	CISE
10/22/2010	Daniel Abramovitch Agilent Laboratories	A Tale of Three Actuators: How Mechanics, Business Models and Position Sensing Affect Difference Mechatronic Servo Problems	CISE
10/28/2010	Vijay Subramanian Hamilton Institute, NUIM, Ireland	Stochastic Switched Networks: Fine Properties of Max-Weight Scheduling	CISE
10/29/2010	Balaji Prabhakar Stanford University	It Pays To Do the Right Thing: Incentive Mechanisms for Societal Networks	CISE
11/5/2010	Tony Jebara Columbia University	Learning from Data Using Matching and Graphs	CISE
11/5/2010	Hatice Altug Boston University	Integrated Nanoplasmonic Systems for Ultra-Sensitive Spectroscopy and Biodetection	MSE
11/9/2010	David J. Bishop LGS, Bell Labs Innovation	Silicon Micromachines for Science and Technology	MSE
11/10/2010	Alessandro Abate Delft University of Technology, The Netherlands	Stochastic Hybrid Systems: Formal Analysis and Computable Verification	CISE
11/12/2010	Ali Abur Northeastern University	Role of Synchronized Measurements in Operation of Smart Grids	CISE
11/19/2010	David Needham Duke University	Engineering Materials Design for Drug Delivery Reverse Engineering the Thermal Sensitive Liposome: A Generally Applicable Approach to Research	MSE
11/19/2010	Uday V. Shanbhag University of Illinois at Urbana-Champaign	Nash Games Under Uncertainty: Characterization Statements and Distributed Computation	CISE
12/1/2010	Turgut M. Gur Stanford University	Utilization and Conversion of Solid Fuels in High Temperature Fuel Cells	MSE
12/3/2010	Shailesh Vora U.S. Department of Energy	U.S. Department of Energy's SECA Program: 2010 Progress and Plans	CEESI, CISE, MSE

DATE	SPEAKER	TITLE	SPONSOR
12/3/2010	Francesco Priolo University of Catania (Italy)	Silicon-Based Nanostructures for Photonics and Solar Cells	MSE, MRS/BU Chapter
12/10/2010	Katherine Ziemer Northeastern University	Using Atoms as Building Blocks: Effective Integration of Functional Oxide Multilayer Heterostructures on Wide Bandgap Semiconductors	MSE
1/21/2011	Alex Stankovic Tufts University	Smart Grid and Other Desiderata: A Future for Electric Energy	CISE
1/28/2011	Hadas Kress-Gazit Cornell University	Language, Logic and Control: Synthesizing Correct, High-Level Robot Behaviors	CISE
1/28/2011	Marek Urban University of Southern Mississippi	From Nano-Scale Heterogeneities to Self-Repairing Polymeric Networks	MSE
2/4/2011	Rakesh Kumar University of Illinois at Urbana-Champaign	Computing with Stochastic Processors: Embracing Errors in Architecture and Design of Processors and Applications	CISE
2/11/2011	Claire Tomlin UC Berkeley	Verification and Control of Hybrid Systems Using Reachability Analysis	CISE
2/11/2011	Amy Prieto Colorado State University	Efficient Approaches for Energy Production and Storage: Photovoltaic	MSE
2/18/2011	Kenny Gross Oracle	Intelligent Power Monitoring and Management for Enterprise Data Centers	CISE
2/25/2011	Pablo Ariel Ruiz Charles River Associates (CRA)	Tractable Cost-Reducing Dynamic Topology Control in Electricity Networks	CISE
3/4/2011	Constantine Caramanis University of Texas	Robustness in High-Dimensional Statistics	CISE
3/4/2011	Ken Sandhage Georgia Institute of Technology	Materials "Alchemy": Shape-Preserving Chemical Conversion of 3-D Biogenic and Synthetic Structures into Catalytic, Sensor, Electronic, and Optical Materials	MSE
3/11/2011	Andrew Ott PJM Interconnection	Alternative Technology Resources in the PJM Wholesale Power Market	CISE
3/25/2011	Sathish Gopalakrishnan University of British Columbia	Dr. GoodEnough: Or How I Learnt to Make Tradeoffs Between Information Quality and Energy Efficiency	CISE
3/25/2011	Mark Bradley Colorado State University	Spontaneous Nanoscale Pattern Formation Induced by Ion Bombardment of Solid Surfaces	MSE, Biophysics, Condensed Matter Seminar Series
4/1/2011	Alejandro Dominguez-Garcia University of Illinois at Urbana-Champaign	Coordination and Control of Distributed Energy Resources for Provision of Ancillary Services	CISE
4/1/2011	Andreas Krause California Institute of Technology	Adaptive Submodularity: A New Approach to Active Learning and Stochastic Optimization	CISE
4/1/2011	Art Gossard University of California, Santa Barbara	Development of Molecular Beam Epitaxy and Bandgap Engineering	MSE
4/8/2011	Chun-Hung Chen George Mason University	Stochastic Simulation and Optimization: An Optimal	CISE

DATE	SPEAKER	TITLE	SPONSOR
4/8/2011	Loo Hay Lee National University of Singapore	Stochastic Simulation and Optimization: An Optimal	CISE
4/8/2011	Lori Goldner University of Massachusetts	Biomolecules in Nanodroplets	BME, MSE
4/11/2011	Rina Tannenbaum Georgia Institute of Technology	Polymer - Matrix Nanocomposites Derived from Renewable Resources	MSE
4/15/2011	John Langford Yahoo! Research	Reductions for Machine Learning	CISE
4/15/2011	Jonathan Klamkin MIT Lincoln Laboratory	Photonic Integrated Circuits and Devices	CISE
4/22/2011	Mehryar Mohri New York University	Learning Kernels Can Help Performance	MSE
4/22/2011	Childers Richard Konarka Technologies	A Review of Photovoltaic Technologies	ASM BU Chapter, MSE
4/29/2011	David Blei Princeton University	Scalable Topic Modeling	CISE
4/29/2011	Emmanuel P. Giannelis Cornell University	Organic Inorganic Hybrids for Energy and Sustainability	MSE, CEESI
5/6/2011	Ramesh Johari Stanford University	Mean Field Equilibria of Dynamic Games: An Introduction and Application to Auctions	CISE
5/11/2011	Massimo Franceschetti University of California	The Interference Barrier: Promises and Limits of Cooperative Communications	CISE
5/13/2011	Mircea Lazar Eindhoven University of Technology	Polyhedral Lyapunov Functions via Proper Conic Partitions	CISE
5/20/2011	Huizhen Janey Yu Massachusetts Institute of Technology	Q-Learning and Enhanced Policy Iteration in Discounted Dynamic Programming	CISE
5/25/2011	Viveck Cadambe University of California, Irvine	Network Interference Management via Interference Alignment	CISE
5/27/2011	Russell D. Dupuis Georgia Institute of Technology	Advances in the MOCVD Growth of III-V Optical and Electronic Devices	ECE, MSE
6/10/2011	Hai Lin National University of Singapore	Guaranteed Global Performance Through Local Coordination	CISE

Research

ECE is a multidisciplinary department with a strong systems perspective. There are three overlapping areas of research and instruction: Electro-Physics, which includes photonics, solid state materials and devices, and electromagnetics and space physics; Information Sciences and Systems, which includes signal and image processing, control and communication systems, and networks; and Computer Engineering, which includes hardware, software applications, and computer networks.

The faculty has collegial ties to a number of important BU research centers, which are detailed at the end of this section. ECE also has strong links with several other departments at the University. Many faculty members pursue collaborative cross-disciplinary research with faculty in other departments and have strong extramural ties in larger centers, multi-university initiatives, and industry collaborators.

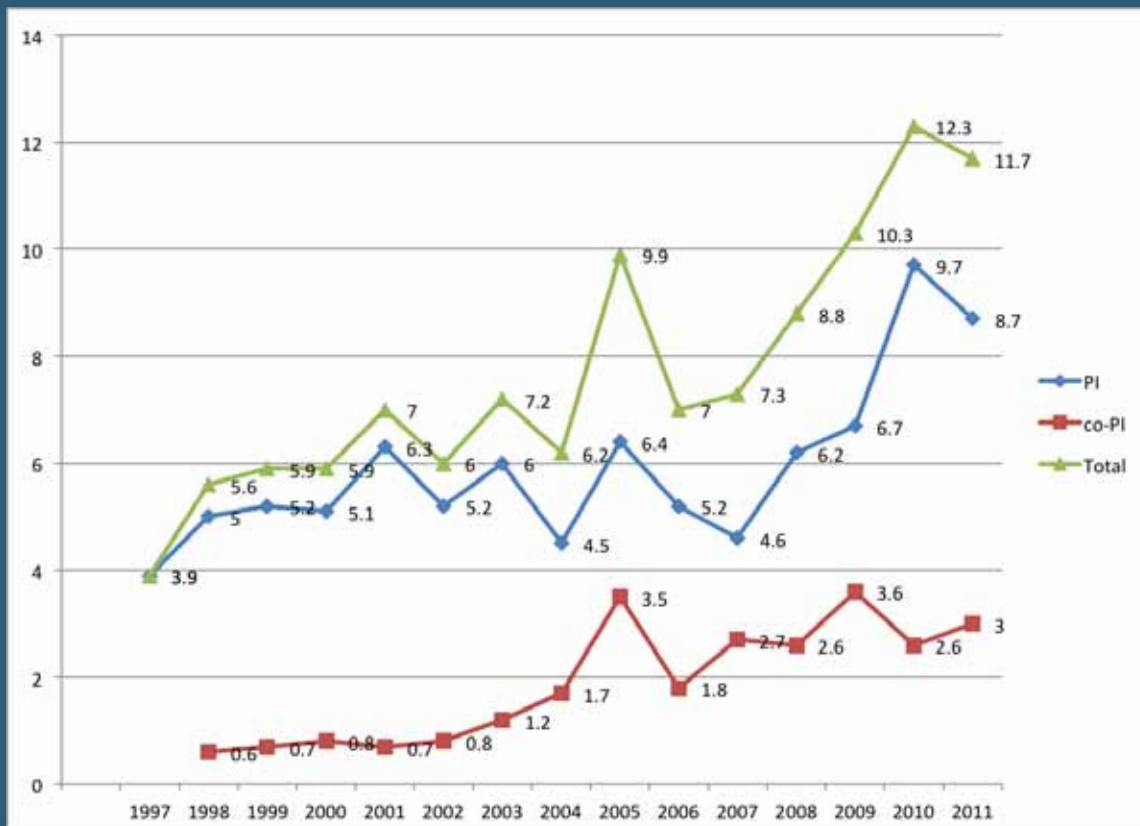
External Research Funding

Research funding has grown significantly in the last decade. Total annual new research funding in the last five years averaged to approximately \$8.7M, compared to \$7.3M in the 2002-2006 period, and \$5.7M in 1997-2001.

The following tables delineate the new and continuing grants awarded over the 2010-2011 fiscal year. The funding level

for new grants, where an ECE faculty member is the Principal Investigator (PI) is approximately \$8.7M. ECE faculty members were also Co-PIs on grants with PIs from other departments, as noted in the table. Their share of the funding for new grants awarded is approximately \$3M. The total of new grants is therefore approximately \$11.7M.

History of External Research Funding (millions of dollars)



New Grants with ECE Principal Investigators

RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END	AMOUNT
Alanyali, Murat	NeTS: Small: Periodic Schedules for Energy-Efficient Wireless Coexistence	NSF	7/15/10	6/30/13	\$345,317
Alanyali, Murat Starobinski, David	NetSE: Medium: Collaborative Research: Promoting Secondary Spectrum Markets via Profitability-Driven Methods and Algorithms	NSF	9/1/10	8/31/14	\$714,501
Altug, Hatice	Development of Multiplexed, Ultra-Sensitive, Label-Free and Rapid Biosensing Technologies for Proteomics and Virus Detection Applications	Commonwealth of Massachusetts, Massachusetts Life Sciences Center	9/1/10	8/31/11	\$93,325
Altug, Hatice	High-Performance NanoPlasmonic Sensors for Biological Warfare Detection	Department of Defense, Navy	5/1/10	4/30/13	\$42,082
Altug, Hatice	CAREER: Plasmonic Multiplexed Bio-Detection and Spectroscopy Systems (RET Supplement)	NSF	5/16/11	1/31/15	\$10,000
Bellotti, Enrico	Theoretical Study of Carrier Transport, Impact Ionization and Radiative Recombination in Si/SiGe Nanostructures	University of Pretoria, South Africa	7/1/10	6/30/12	\$119,310
Bellotti, Enrico	Photon-Trap Structures for Quantum Advanced Detectors (PT-SQUAD)	Department of Defense, Defense Advanced Research Projects Agency (DARPA)	8/18/09	9/1/11	\$85,158
Bellotti, Enrico	SBIR Phase II - Advanced Space Sensor Components and Concepts (Subcontract via Photronix, Inc.)	Department of Defense, Air Force Office of Scientific Research (AFOSR)	9/20/10	9/20/12	\$119,993
Cassandras, Christos	Real-Time Optimization in Complex Stochastic Environment	Department of Defense, Air Force Office of Scientific Research (AFOSR)	12/1/10	11/30/11	\$127,264
Castañón, David	Automated Threat Detection for Whole Body Imaging	Department of Energy, Pacific Northwest Laboratory	6/30/09	6/30/10	\$42,590
Castañón, David	Freeswim: Autonomous Behaviors for Undersea Sensors	Department of Defense, Office of Naval Research (ONR)	8/20/10	1/20/11	\$22,001
Castañón, David	Games, Information, and Deception Exploitation for Adversarial Network Systems	Department of Defense, Air Force Office of Scientific Research (AFOSR)	9/15/10	9/14/11	\$99,772
Castañón, David	MURI: Fusion and Sensor Management for Automatic Target Exploitation	Department of Defense, Air Force Office of Scientific Research (AFOSR)	10/1/09	4/30/11	\$125,106

RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END	AMOUNT
Castañón, David	ALERT: Awareness and Location of Explosive-Related Threats	Department of Homeland Security	7/1/08	6/30/11	\$100,00
Castañón, David	ALERT: Awareness and Location of Explosive-Related Threats	Department of Homeland Security	7/1/08	6/30/11	\$245,000
Dal Negro, Luca	Deterministic Aperiodic Structures for On-Chip Nanophotonics and Nanoplasmonics Device Applications	Department of Defense, Air Force Office of Scientific Research (AFOSR)	12/1/10	11/30/11	\$159,999
Dal Negro, Luca	MURI: Electrically-Pumped, Silicon-Based Lasers for Chip-Scale Nanophotonic Systems	Department of Defense, Air Force Office of Scientific Research (AFOSR)	7/1/06	6/30/11	\$55,166
Dal Negro, Luca	Engineering Structural Color in Metal Films	APIC Corporation	7/1/11	6/30/12	\$150,000
Densmore, Douglas	A Tool-Chain to Accelerate Synthetic Biological Engineering	Department of Defense, Defense Advanced Research Projects Agency (DARPA)	9/23/10	9/21/11	\$47,900
Horenstein, Mark	Compact Low-Power Driver for Deformable Mirror Systems (Subcontract via Boston Micromachines Corporation)	NASA	1/28/10	7/28/10	\$3,142
Horenstein, Mark Mazumder, Malay	Self-Cleaning Solar Panels with Electrodynamic Screens for Desert Installations	United States-Israel Binational Science Foundation	9/1/10	8/31/11	\$44,000
Hubbard, Allyn	Advanced Auditory Modeling for Acoustic Analysis (STTR Phase 1)	Department of Defense, Air Force-Rome Laboratories	5/1/10	1/31/11	\$34,785
Ishwar, Prakash	Dynamic Information Collection and Fusion	Department of Defense, Air Force Office of Scientific Research (AFOSR)	8/15/10	8/14/11	\$140,000
Karl, W. Clement	A Biomedical Imaging Acceleration Testbed (Subcontract via Northeastern University)	NSF	12/15/10	11/30/11	\$34,990
Lee, Min-Chang	Investigation of Ionospheric Turbulence and Whistler Wave Interactions with Space Plasmas	Department of Defense, Air Force Office of Scientific Research (AFOSR)	12/1/10	11/30/11	\$211,510
Little, Thomas Altug, Hatice Ünlü, M. Selim	Consortium for Ocean Sensing in the Near-shore Environment	Department of Commerce, National Oceanic and Atmospheric Administration (NOAA)	2/1/10	1/31/11	\$24,178

RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END	AMOUNT
Little, Thomas Altug, Hatice Ünlü, M. Selim	Consortium for Ocean Sensing in the Near-shore Environment	Department of Commerce, National Oceanic and Atmospheric Administration (NOAA)	2/1/11	1/31/12	\$25,080
Little, Thomas Altug, Hatice Ünlü, M. Selim	NSF Engineering Research Center for Smart Lighting - Administration	NSF	9/1/08	8/31/10	\$678,000
Moustakas, Theodore	Investigation of Rapid Thermal Annealing of Oxide Semiconductor Samples	NASA	1/1/11	6/30/11	\$19,656
Moustakas, Theodore Dal Negro, Luca Paiella, Roberto	Sub-250 nm Electron-Beam Pumped Semiconductor Laser (SBIR)	Department of Defense, Defense Advanced Research Projects Agency (DARPA)	12/20/10	12/19/12	\$1,521,034
Oliver, William	Undergraduate Mining of Incoherent Scatter Radar Data Bases	NSF	6/1/10	7/31/11	\$84,039
Oliver, William	Undergraduate Mining of Incoherent Scatter Radar Data Bases	NSF	6/1/10	7/31/12	\$86,427
Oliver, William Martinis, Carlos	CEDAR: Comprehensive Use of Incoherent Scatter Radar Data to Study the Equatorial Midnight Plasma and Neutral Temperature Maxima (MTM)	NSF	1/1/11	12/31/11	\$111,500
Paiella, Roberto	Plasmonic Nanostructures Integrated with Semiconductor Light Emitting Materials for Enhanced Efficiency and Functionality	Department of Energy	1/1/11	12/31/12	\$155,000
Paiella, Roberto	Collaborative Research: Quantum-Cascade-Laser Active Materials Based on Silicon-Germanium Nanomembranes	NSF	7/1/10	6/30/12	\$80,849
Paschalidis, Ioannis Kozakov, Dmytro	Refinement Methods for Protein Docking Based on Exploring Multi-Dimensional Energy Funnels	Department of Health and Human Services, NIBIB	4/1/11	3/31/12	\$286,504
Paschalidis, Ioannis Kozakov, Dmytro	Refinement Methods for Protein Docking Based on Exploring Multi-Dimensional Energy Funnels	Department of Health and Human Services, NIBIB	4/1/11	3/31/12	\$28,651
Paschalidis, Ioannis Crovella, Mark Cassandras, Christos	Information and Software Assurance: A Coordinated Approach To Cyber-Situation Awareness Based on Traffic Anomaly	Department of Defense, Army Research Office (ARO)	6/3/11	2/2/12	\$130,000
Ramachandran, Sid-dharth	Power-Scalable Blue-Green Bessel Beams	Department of Defense, Office of Naval Research (ONR)	1/1/11	12/31/11	\$255,818
Ramachandran, Sid-dharth	High-Power Blue-Green Lasers for Communications	Department of Defense, Office of Naval Research (ONR)	11/1/10	4/30/13	\$120,000

RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END	AMOUNT
Ramachandran, Sid-dharth	High-Power Blue-Green Lasers for Communications	Department of Defense, Office of Naval Research (ONR)	11/1/10	4/30/13	\$120,000
Ramachandra, Sid-dharth	High-Power Blue-Green Lasers for Communications	Department of Defense, Office of Naval Research (ONR)	11/1/10	4/30/13	\$100,000
Ramachandra, Sid-dharth	High-Power Blue-Green Lasers for Communications	Department of Defense, Office of Naval Research (ONR)	11/1/10	4/30/13	\$130,000
Ramachandran, Sid-dharth	Higher Dimensional Information Encoding with Vortex Fibers	Department of Defense, Defense Advanced Research Projects Agency (DARPA)	4/29/11	4/28/12	\$224,784
Ruane, Michael Brossman, Cynthia	TRIPSS - RET Site in Biophotonics Sensors and Systems	NSF	6/1/10	6/30/12	\$274,970
Saligrama, Venkatesh	A Pixel-Level Statistical Approach for Image/Video Event Detection	MIT/Lincoln Laboratory	2/1/11	10/31/11	\$80,000
Saligrama, Venkatesh	Smart Distributed Sensor Fields	Department of Defense, Office of Naval Research (ONR)	1/11/10	1/10/13	\$25,000
Saligrama, Venkatesh	Smart Distributed Sensor Fields	Department of Defense, Office of Naval Research (ONR)	1/11/10	1/10/13	\$75,000
Semeter, Joshua	Solar Maximum Studies at the Millstone Hill Observatory	NSF	11/1/10	10/31/11	\$43,224
Semeter, Joshua	CEDAR-GEM Postdoc: High Resolution Measurements and Modeling of Auroral Small-Scale Processes	NSF	4/1/11	4/30/12	\$100,000
Sergienko, Alexander	High Information Capacity Quantum Imaging	Department of Defense	9/1/10	8/31/11	\$16,667
Sergienko, Alexander	High Information Capacity Quantum Imaging (Subcontract via University of Rochester)	Department of Defense, Army Research Office (ARO)	9/1/10	9/30/11	\$100,000
Starobinski, David Trachtenberg, Ari	CIF: Small: Large-Scale Software Dissemination in Stochastic Wireless Networks (REU Supplement)	NSF	6/1/10	8/31/12	\$12,000
Ünlü, M. Selim DeLisi, Charles Goldberg, Bennett Irani, Rostem	STTR Phase II: High Speed Diagnostic of Temperature and Intensity Variation of Diode-Laser Facets	Department of Defense, Army Aviation and Missile Command	8/1/10	6/30/12	\$110,879
Ünlü, M. Selim DeLisi, Charles Goldberg, Bennett Irani, Rostem	Floating Light-Activated Micro-Electrical Stimulators for Neural Prosthetics	Department of Health and Human Services, NIBIB	8/1/10	5/31/11	\$156,411

RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END	AMOUNT
Ünlü, M. Selim DeLisi, Charles Goldberg, Bennett Irani, Rostem	High Throughput Quantification of Con-formation and Kinetics of DNA-Protein Complexes	NSF	9/15/09	8/31/11	\$110,000
Ünlü, M. Selim DeLisi, Charles Goldberg, Bennett Irani, Rostem	MITRE Research Agreement	Mitre Corporation	10/1/10	9/30/11	\$85,000
Ünlü, M. Selim DeLisi, Charles Goldberg, Bennett Irani, Rostem	Floating Light-Activated Micro-Electrical Stimulators for Neural Prosthetics	Department of Health and Human Services, NIBIB	6/1/11	5/31/12	\$108,730
SUBTOTAL	GRANTS WITH ECE PIs				\$8,652,312

New Grants with ECE co-PIs

RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END	AMOUNT
Altug, Hatice	RESONANT Optical Virus Reader (ROVR) Phase II	Department of Defense, Army Research Office (ARO)	7/1/10	6/30/11	\$350,000
Brower, Richard Rebbi, Claudio	Collaborative Research: SI2-SSI: Scalable Hierarchical Algorithms for Extreme Computing (SHARE)	NSF	9/15/10	8/31/11	\$249,034
Belta, Calin Cassandras, Christos	MURI- Smart Adaptive Reliable Teams for Persistent Surveillance (Subcontract via Massachusetts Institute of Technology)	Department of Defense, Office of Naval Research (ONR)	6/1/09	5/31/12	\$72,500
Baillieul, John Castañón, David	Behavioral Dynamics in the Cooperative Control of Mixed Human/Robotic Teams (MURI-07)	Department of Defense, Air Force Office of Scientific Research (AFOSR)	12/1/10	11/30/11	\$1,511,222
Reinhard, Bjorn M. Dal Negro, Luca	Chemically Enhanced Photonic - Plasmonic Crystals for Explosive Vapor Detection: Phase II	Department of Defense, Army Research Office (ARO)	7/1/10	6/30/11	\$262,000
Campbell, David Horenstein, Mark	No Longer a Dream Deferred: Greater Minority STEM Participation Through Academic and Institutional Change	NSF	3/1/06	2/28/11	\$132,100

RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END	AMOUNT
Mountain, David Hubbard, Allyn Cotanche, Douglas Barbone, Paul	Active Filtering in the Cochlea	Department of Health and Human Services (NIDCD)	9/1/10	8/31/11	\$713,343
Versace, Massimiliano Joshi, Ajay	Plastic Neuromorphic Hardware for Autonomous Navigation in Mobile Robots	NSF Center of Learning in Education, Science and Technology (CELEST)	3/1/11	2/29/12	\$63,287
Moustakas, Theodore	Development of Packaged UV LED and Lamps Emitting at 266 nm for Water-Air Purification and Surface Sterilization	Department of Defense, Army Research Office (ARO)	7/1/10	6/30/11	\$250,000
De Luca, Carlo Nawab, S. Hamid Roy, Serge Jabre, Joe	Wearable-Sensor System for Monitoring Motor Function	Department of Health and Human Services (NIBIB)	9/1/10	8/31/11	\$654,993
Ramachandran, Siddharth	A Flexible, Lightweight, Remotely-Accessible THz Source and Detector	Department of Defense, Army Research Office (ARO)	7/1/10	6/30/11	\$250,000
Crovella, Mark Homer, Steve Reyzin, Leo Trachtenberg, Ari Goldberg, Sharon Karpovsky, Mark Starobinski, David Triandopoulos, Nikos Zlateva, Tanya	TC: Large: Securing the Open Softphone	NSF	7/1/10	6/30/11	\$638,595
Crovella Mark Homer, Steve Reyzin, Leo Trachtenberg, Ari Goldberg, Sharon	TC: Large: Securing the Open Softphone (REU Supplement)	NSF	3/1/11	6/30/11	\$40,625
Ünlü, M. Selim	BU/CIMIT Applied Healthcare Engineering Fellowship	Department of Defense, Army Medical Research Acquisition Activity (USEMRAA)	1/1/10	12/3/10	\$125,000
Goldberg, G Ünlü, M. Selim	Next Generation Solid Immersion Microscopy for Fault Isolation in Back-Side Analysis	Office of the Director of National Intelligence/IARPA	11/10/10	6/15/12	\$2,071,000
Subtotal	Grants With ECE co-PIs				\$2,987,793
GRAND TOTAL					\$11,640,105

Continuing Grants

RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END
Altug, Hatice	Career: Nano-Plasmonic Resonances for Biodetection Systems	NSF	2/15/10	1/31/15
Bellotti, Enrico	Theoretical Investigation of Optoelectronic Devices Based on the ZNO Material System	NSF	6/1/09	5/31/12
Cassandras, Christos Paschalidis, Ioannis Bestavros, Azer	EFRI-ARESCI: Event-Driven Sensing for Enterprise Reconfigurability and Optimization	NSF	11/1/07	10/31/11
Cassandras, Christos	Real-Time Optimization in Complex Stochastic Environment	Air Force Office of Scientific Research (AFOSR)	3/1/09	11/30/11
Castañón, David Ruane, Michael Sergienko, Alexander Teich, Malvin Barbone, Paul Cleveland, R.obin Murray, Todd Roy, Ronald	ERC: Center for Subsurface Sensing and Imaging Systems (CenSSIS)	NSF via Northeastern University	7/1/00	8/31/12
Dal Negro, Luca	(Durip10) 1.54 Mm Optical Gain in Si and Ge-based Structures for Optical Amplification and Electrically Pumped Lasers	AFOSR DURIP	6/1/10	9/30/11
Dal Degro, Luca	Silk Based Optical Food Sensors	AFOSR via Tufts University	3/1/10	8/31/11
Dal Negro, Luca	Biodegradable Communications System	DOD/Army via Tufts University	1/1/08	1/31/12
Dal Negro, Luca	CAREER: Combined Light and Carrier Localization in High-Refractive Index Silicon Nanocrystal Structures: A Novel Approach for Si-Based Lasers	NSF	8/1/09	7/31/14
Ishwar, Prakash	CIF: Small: Collaborative Research: Towards a Paradigm Shift In Distributed Information Processing: Harnessing Group-Structure	NSF	7/1/09	6/30/12
Ishwar, Prakash	CAREER: Information-Scaling Laws, Bit-Conservation Principles, and Robust Coding Architectures in Sensor Networks	NSF	12/15/05	11/30/11
Little, Thomas Altug, Hatice Ruane, Michael Ünlü, M. Selim	NSF Engineering Research Center (ERC) for Smart Lighting	NSF via Rensselaer Polytech	9/1/08	8/31/11
Little, Thomas Konrad, Janusz Ishwar, Prakash	NETS-NOSS: Localized Computation and Network Path Formation to Enable Pervasive Video Sensing	NSF	9/1/07	8/31/11
Little, Thomas Konrad, Janusz Ishwar, Prakash	Reu Supplement: Nets-Noss: Localized Computation and Network Path Formation to Enable Pervasive Video Sensing	NSF	5/1/08	8/31/11
Mazumder, Malay	Electrostatic Dry Powder Inhaler for Constant Dose Respiratory Drug Delivery	CIMIT via MGH/USAMR AA	1/1/10	9/30/11
Moustakas, Theodore	Development of an Electron Beam Injected Laser Structure at 235nm Based on AlGaN/AlN Multiple Quantum Wells on SiC Substrates	NASA via Photon Systems	1/15/10	1/15/12

RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END
Paiella, Roberto Bellotti, Enrico	GaN-Based Quantum-Structure Devices for THz Light Emission and Photodetection	NSF	9/1/08	8/31/11
Paschalidis, Ioannis Cassandras, Christos	Distributed Wireless Sensor Networks for Long-Term Deployments	Department of Energy	9/1/06	8/31/12
Roy, Ronald	The Utilization of the Analogic Ultrasound Imaging Engine in APIAnd MEDBED	NSF via North-eastern University	5/1/03	8/31/12
Roy, Ronald	Quantum Optical Coherence Tomography (CenSSIS Supplement)	NSF via North-eastern University	5/1/03	8/31/12
Ruane, Michael Fawcett, Helen	RET-TRIPSS: Teachers' Research in Biophotonics - Sensors and Systems	NSF	6/1/10	6/30/12
Saligrama, Venkatesh	CPS: Medium: Collaborative Research: The Foundations of Implicit and Explicit Communication In Cyber-physical Systems	NSF	9/15/09	8/31/12
Saligrama, Venkatesh Konrad, Janusz	Video Analytics: An Event Based Statistical Approach	Department of Defense / National Geospatial Intelligence Agency	9/23/09	9/22/12
Saligrama, Venkatesh Konrad, Janusz	From Frames To Events: A Statistical Approach to Behavior Analysis In Multi-Camera Systems	NSF	7/15/09	6/30/12
Saligrama, Venkatesh	CAREER: A Systems Approach To Networked Decision Making In Uncertain Environments	NSF	6/1/05	5/31/12
Starobinski, David Trachtenberg, Ari	CIF: Small: Large-Scale Software Dissemination in Stochastic Wireless Networks	NSF	9/1/09	8/31/12
Starobinski, David	Self-Forming Extensible Lunar Extravehicular Activity Network (Selene)	NASA SBIR II via SCIENTIFIC SYSTEMS	3/18/09	8/1/11
Swan, Anna	Vibrational and Electronic Aspects of Carbon Nanotubes and Their Interactions	NSF	9/1/07	9/30/11
Swan, Anna	REU Supplement: Vibrational and Electronic Aspects of Carbon Nanotubes and Their Interactions	NSF	10/14/08	9/30/11
Swan, Anna Altug, Hatice	NUE: Undergraduate Laboratory Experiences in Nanotechnology Devices and Systems (U-LENS)	NSF	9/1/09	8/31/11
Trachtenberg, Ari Starobinski, David	A Theory of Monitoring Based on Identifying Codes and Their Variants	NSF	10/1/07	9/30/11
Trachtenberg, Ari Starobinski, David	REU Supplement: A Theory of Monitoring Based on Identifying Codes and their Variants	NSF	5/1/09	9/30/11
Ünlü, M. Selim Swan, Anna	IRES: US-Turkey-Switzerland Collaboration on Resonant Structures for Biosensing and Imaging	NSF	5/1/06	8/31/11
Ünlü, M. Selim Swan, Anna	IRES: US-Turkey-Switzerland Collaboration on Resonant Structures for Biosensing and Imaging	NSF	5/1/06	8/31/11
Ünlü, M. Selim	Graduate Assistance in Areas of National Need Fellowship in Nano-Biotechnology	DoED	8/16/10	8/15/13

Gifts

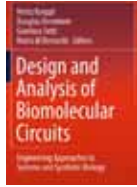
RECIPIENT	SOURCE	AMOUNT
Coskun, Ayse	Design Automation Conference (DAC)	\$24,000
Coskun, Ayse	Oracle Corporation	\$100,000
Coskun, Ayse	VMware, Inc.	\$67,000
Densmore, Douglas	Autodesk, Inc.	\$5,000
Densmore, Douglas	BBN Technologies	\$1,000
Horenstein, Mark	Boston Micromachines	\$9,400
Ramachandran, Siddharth	ExxonMobil Research & Engineering	\$30,000
Ramachandran, Siddharth	Japan Patent Office	\$10,000
Sergienko, Alexander	Capella Photonics, Inc.	\$75,000
Total Gifts		\$321,400



Assistant Professor Hatice Altug works with PhD candidate, Min Huang, on Smart Lighting Center research.

Faculty Publications

Books



H. Koepl, **D. DENSMORE**, M. Bernardo, and G. Setti (editors), *Design and Analysis of Biomolecular Circuits*, Springer, May 30, 2011.



P. W. Gross and **P. R. KOTIUGA**, *Electromagnetic Theory and Computation: A Topological Approach* (reprint edition), Cambridge University Press, April 28, 2011.

Book Chapters

H. ALTUG, D. Englund, and J. Vuckovic, "Photonic Crystal Microcavity Light Sources," in *Comprehensive Semiconductor Science and Technology*, P. Bhattacharya, R. Fornari, and H. Kamimura (editors), Elsevier Science, March 29, 2011.

R. C. BROWER, "Lattice Gauge Theory for Physics Beyond the Standard Model," in *Recontres de Moriond 2009: QCD and High Energy Interactions*, 2010.

D. CASTAÑÓN, "Linear Algebra," in *Introduction to Subsurface Imaging*, B. Saleh (editor), Cambridge University Press, April 29, 2011.

W. C. KARL and E. L. Miller, "Digital Subsurfacing Imaging," in *Introduction to Subsurface Imaging*, B. Saleh (editor), Cambridge University Press, April 29, 2011.

K. D. Akdemir, Z. Wang, **M. G. KARPOVSKY**, and B. Sunar, "Design of Cryptographic Devices Resilient to Fault Injection Attacks Using Nonlinear Robust Codes," in *Fault Analysis in Cryptography*, M. Joux and M. Tunstall (editors), March 2011.

J. KONRAD, "3D Displays," in *Optical and Digital Image Processing*, G. Cristobal, P. Schelkens, and H. Thienpont, (editors), Wiley-VCH, chapter 17, June 21, 2011.

M. K. MAZUMDER et al., "Electrostatic Removal of Particles and its Applications to Self-Cleaning Solar Panels and Solar Concentrators," in *Developments in Surface Contamination and Cleaning, Vol. 3: Methods for Removal of Particle Contaminants*, R. Kohli and

K. L. Mittal (editors), Elsevier Science (William Andrew), April 14, 2011.

R. PAIELLA, "Quantum Cascade Lasers," in *Comprehensive Semiconductor Science and Technology*, P. Bhattacharya, R. Fornari, and H. Kamimura (editors), Elsevier Science, March 29, 2011.

E. Ermis, P. Jodoin, and **V. SALIGRAMA**, "Information Fusion and Anomaly Detection with Uncalibrated Cameras in Video Surveillance," in *Multimedia Information Extraction*, IEEE Press, 2010.

Journal Articles

A. Al Daoud, **M. ALANYALI**, and **D. STAROBINSKI**, "Reservation Policies for Revenue Maximization from Secondary Spectrum Access in Cellular Networks," *Elsevier Journal of Computer Networks*, vol. 55, no. 1, pp. 214-224, January 7, 2011.

M. ALANYALI and M. Dashouk, "Occupancy Distributions of Homogeneous Queueing Systems Under Opportunistic Scheduling," *IEEE Transactions on Information Theory*, vol. 57, no. 1, p. 256, January 2011.

V. Liberman, R. Adato, A. Mertiri, A. A. Yanik, K. Chen, T. H. Jeys, S. Erramilli, and **H. ALTUG**, "Angle- and Polarization-Dependent Collective Excitation of Plasmonic Nanoarrays for Surface Enhanced Infrared Spectroscopy," *Optics Express*, vol. 19, no. 12, pp. 11202-11212, May 24, 2011.

- M. Turkmen, S. Aksu, A. E. Cetin, A. A. Yanik, and **H. ALTUG**, "Multi-Resonant Metamaterials Based on UT-Shaped Nano-Aperture Antennas," *Optics Express*, vol. 19, no. 8, pp. 7921-7928, April 8, 2011.
- A. Artar, A. A. Yanik, and **H. ALTUG**, "Multi-Spectral Plasmon Induced Transparency in Coupled Meta-Atoms," *Nano Letters*, vol. 11, no. 11, pp. 1685-1689, March 25, 2011.
- A. E. Cetin, A. A. Yanik, C. Yilmaz, S. Somu, A. B. Busnaina, and **H. ALTUG**, "Monopole Antenna Arrays for Optical Trapping, Spectroscopy and Sensing," *Applied Physics Letters*, vol. 98, no. 11, article no. 111110, March 17, 2011.
- A. A. Yanik, M. Huang, O. Kamohara, A. Artar, T. W. Giesbert, J. J. Connor and **H. ALTUG**, "An Optofluidic Nanoplasmonic Biosensor for Direct Detection of Live Viruses from Biological Media," *Nano Letters*, vol. 10, no. 12, pp. 4962-4969, November 5, 2010.
- F. Bertazzi, M. Goano, and **E. BELLOTTI**, "A Numerical Study of Auger Recombination in Bulk InGaN," *Applied Physics Letters*, vol. 97, no. 23, December 10, 2010.
- M. Moresco, M. Penna, F. Bertazzi, M. Goano, and **E. BELLOTTI**, "Full-Band Monte Carlo Simulation of HgCdTe APDs," *Journal of Electronic Materials*, vol. 39, no. 7, pp. 912-917, July 2010.
- E. Furno, M. Penna, S. Chiaria, M. Goano, and **E. BELLOTTI**, "Electronic and Optical Properties of $MgxZn_{1-x}O$ and $BexZn_{1-x}O$ Quantum Wells," *Journal of Electronic Materials*, vol. 39, no. 7, pp. 936-944, July 2010.
- E. BELLOTTI** and **R. PAIELLA**, "Numerical Simulation of ZnO-Based Terahertz Quantum Cascade Lasers," *Journal of Electronic Materials*, vol. 39, no. 7, pp. 1097-1103, July 2010.
- C. A. Mosse, C. Eliot-Laize, L. Lovat, A. J. MacRobert, **I. J. BIGIO**, and S. G. Bown, "Optical Measurement of Photosensitizer Concentrations In Vivo," *Journal of Innovative Optical Health Sciences*, vol. 4, no. 2, pp. 97-111, April 2011.
- E. Rodriguez-Diaz, **I. J. BIGIO**, and S. K. Singh, "Integrated Optical Tools for Minimally Invasive Diagnosis and Treatment at Gastrointestinal Endoscopy," *Robotics and Computer-Integrated Manufacturing*, vol. 27, no. 2, pp. 249-256, April 2011.
- K. Calabro, A. Curtis, J. Galarneau, T. Krucker, and **I. J. BIGIO**, "Gender Variations in the Optical Properties of Skin in Murine Animal Models," *Journal of Biomedical Optics*, vol. 16, no. 1, article no. 011008, January 1, 2011.
- S. Joshi, A. Ergin, M. Wang, J. N. Bruce, and **I. J. BIGIO**, "Inconsistent Blood Brain Barrier Disruption by Intraarterial Mannitol in Rabbits: Implications for Chemotherapy," *Journal of Neuro-Oncology*, December 12, 2010.
- A. Curtis, K. W. Calabro, J. Galarneau, **I. J. BIGIO**, and T. Krucker, "Temporal Variations of Skin Pigmentation in C57Bl/6 Mice Affect Optical Bioluminescence Quantitation," *Molecular Imaging and Biology*, October 20, 2010.
- M. R. Austwick, B. Clark, C. A. Mosse, K. Johnson, D. W. Chicken, S. K. Somasundaram, Y. Zhu, M. Falzon, G. Kocjan, T. Fearn, S. G. Bown, **I. J. BIGIO**, and M. R. S. Keshtgar, "Scanned Elastic Scattering Spectroscopy Detects Metastatic Breast Cancer in Sentinel Lymph Nodes," *Journal of Biomedical Optics*, vol. 15, no. 4, article no. 047001, July 1, 2010.
- R. BROWER**, M. Djuric, I. Sarcevic, and C. Tan, "String-Gauge Dual Description of Deep Inelastic Scattering at Small-x," *Journal of High Energy Physics*, vol. 1011, no. 051, September 9, 2010.
- S. M. Keene and **J. CARRUTHERS**, "Collision Localization for IEEE 802.11 Wireless LANs," *Wireless Personal Communications*, vol. 53, no. 3, August 15, 2010.
- C. Yao and **C. G. CASSANDRAS**, "Perturbation Analysis and Optimization of Multiclass Multiobjective Stochastic Flow Models," *Journal of Discrete Event Dynamic Systems*, vol. 21, no. 2, June 2011.
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X. C. Ding, C. Belta, and **C. G. CASSANDRAS**, "Receding Horizon Surveillance with Temporal Logic Specifications," *49th IEEE Conference on Decision and Control*, December 2010.

C. Yao and **C. G. CASSANDRAS**, "A Stochastic Hybrid System View at a Class of Non-Cooperative Games," *26th IEEE Convention of Electrical and Electronics Engineers in Israel*, November 2010.

C. Yao and **C. G. CASSANDRAS**, "Perturbation Analysis of Stochastic Hybrid Systems and Applications to Some Non-Cooperative Games," *10th International Workshop on Discrete Event Systems (WODES 2010)*, September 2010.

A. K. Bangla and **D. A. CASTAÑÓN**, "Pseudo-Polynomial Auction Algorithms for Nonlinear Resource Allocation," *2011 American Control Conference*, June 2011.

R. Kumar and **D. A. CASTAÑÓN**, "Advanced Traveler Information Systems with Communication Constraints," *2011 American Control Conference*, June 2011.

K. Jenkins and **D. A. CASTAÑÓN**, "Information-Based Adaptive Sensor Management in Sensor Networks," *2011 American Control Conference*, June 2011.

K. Chen and **D. A. CASTAÑÓN**, "Robust Multifrequency Inversion in Terahertz Diffraction Tomography," *IS&T/SPIE Electronic Imaging*, January 2011.

D. Hitchings and **D. A. CASTAÑÓN**, "Adaptive Sensing with Continuous Action and Measurement Spaces," *49th IEEE Conference on Decision and Control*, December 2010.

K. Jenkins and **D. A. CASTAÑÓN**, "Fast Algorithms for Adaptive Feature-Based Sensor Management," *49th IEEE Conference on Decision and Control*, December 2010.

A. Bangla and **D. A. CASTAÑÓN**, "Auction Algorithms for Non-linear Resource Allocation," *2010 Conference on Decision and Control*, December 2010.

- C. Crawford, J. Beaty, **D. A. CASTAÑÓN**, and H. Martz, "Facilitation of Third-Party Development of Advanced Algorithms for Explosive Detection Using Workshops and Grand Challenges," *10th Annual IEEE International Conference on Technologies for Homeland Security*, November 2010.
- R. Kumar and **D. A. CASTAÑÓN**, "A New Algorithm For Outlier Rejection in Particle Filters," *13th International Conference on Information Fusion (Fusion 2010)*, July 2010.
- R. Kumar, **D. CASTAÑÓN**, E. Ermis, and **V. SALIGRAMA**, "A New Algorithm for Outlier Rejection in Particle Filters," *13th International Conference on Information Fusion (Fusion 2010)*, July 2010.
- J. Meng, C. Chen, **A. K. COSKUN**, and **A. JOSHI**, "Run-Time Energy Management of Manycore Systems Through Reconfigurable Interconnects," *Association for Computing Machinery (ACM) Great Lakes Symposium on VLSI (GLSVLSI 2011)*, May 2011.
- M. M. Sabry, D. Atienza, and **A. K. COSKUN**, "Thermal Analysis and Active Cooling Management for 3D MPSoCs," in *IEEE International Symposium on Circuits and Systems (ISCAS)*, May 2011.
- M. Sabry, **A. K. COSKUN**, and D. Atienza, "Fuzzy Control for Enforcing Energy Efficiency in High-Performance 3D Systems," *International Conference on Computer-Aided Design (ICCAD)*, November 2010.
- L. DAL NEGRO**, "Waves in a Labyrinth: Aperiodic Nanophotonics," *Waves and Quantum Fields on Fractals (A Research Workshop of the Israel Science Foundation and the Lewiner Institute)*, June 2011.
- L. DAL NEGRO**, "Light Emission from Silicon Nanostructures: Past, Present and Future Perspectives," *219th Electrochemical Society Meeting*, May 2011.
- L. DAL NEGRO**, "Engineering Aperiodic Order in Nanoplasmonic Devices," *SPIE Photonics West*, January 2011.
- L. DAL NEGRO**, "Understanding Aperiodic Order in Nanophotonics," *U. S. Army Research Laboratory (ARL) Workshop, Multi-Scale Multi-Disciplinary Modeling (MMM) of Electronic Materials*, September 2010.
- J. Yang, S. V. Boriskina, H. Noh, M. J. Rooks, G. S. Solomon, **L. DAL NEGRO**, and H. Cao, "Demonstration of Laser Action in a Pseudorandom Medium," *Active Photonic Materials III*, August 2010.
- J. Henson, J. DiMaria, E. Dimakis, R. Li, S. Minissale, **L. DAL NEGRO**, **T. D. MOUSTAKAS**, and **R. PAIELLA**, "Plasmon-Enhanced Emission Rates from III-Nitride Quantum Wells Using Tunable Surface Plasmons," *Materials Research Society Fall Meeting*, November 2010.
- M. Chiu, M. A. Khan, and **M. C. HERBORDT**, "Efficient Calculation of Pairwise Nonbonded Forces," *19th Annual International IEEE Symposium on Field-Programmable Custom Computing Machines*, May 2011.
- M. Chiu and **M. C. HERBORDT**, "Towards Production FPGA-Accelerated Molecular Dynamics: Progress and Challenges," *4th International Workshop on High-Performance Reconfigurable Computing Technology and Applications (HPRCTA '10)*, November 2010.
- C. Pascoe, A. Lawande, H. Lam, A. George, Y. Sun, W. Farmerie, and **M. C. HERBORDT**, "Reconfigurable Supercomputing with Scalable Systolic Arrays and In-Stream Control for Wavefront Genomics Processing," *2010 Symposium on Application Accelerators in High Performance Computing*, July 2010.
- Y. Pu and **A. HUBBARD**, "A FPGA-Based Sound Classification and Localization System That Uses Output From a Biomimetic Model," *Biomedical Engineering Society Annual Meeting*, October 2010.
- D. J. Kim, D. C. Mountain, and **A. HUBBARD**, "Power Flow in the Sandwich Model of the Cochlea," *Biomedical Engineering Society Annual Meeting*, October 2010.
- L. Eger, S. Do, **P. ISHWAR**, **W. C. KARL**, and H. Pien, "A Learning-Based Approach to Explosives Detection Using Multi-Energy X-Ray Computed Tomography," *IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, May 2011, pp. 2004-2007.
- B. Orten, **P. ISHWAR**, **W. C. KARL**, and **V. SALIGRAMA**, "Sensing-Aware Classification with High-Dimensional Data," *IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, May 2011, pp. 3700-3703.
- L. Eger, **P. ISHWAR**, **W. C. KARL**, and H. Pien, "Classification-

Aware Dimensionality Reduction Methods for Explosives Detection Using Multi Energy X-Ray Computed Tomography," *SPIE International Conference on Computational Imaging IX*, vol. 7873, February 2011.

Y. Wang, S. Rane, S. C. Draper, and **P. ISHWAR**, "An Information-Theoretic Analysis of Revocability and Reusability in Secure Biometrics," *6th IEEE International Workshop on Information Theory and Applications (ITA)*, February 2011, pp. 1-10.

Y. Wang, S. Rane, W. Sun, and **P. ISHWAR**, "On Unconditionally Secure Computation with Vanishing Communication Cost," *Allerton 2010: 48th Annual Allerton Conference on Communication, Control, and Computing*, September-October 2010.

K. Guo, **P. ISHWAR**, and **J. KONRAD**, "Action Recognition Using Sparse Representation on Covariance Manifolds of Optical Flow," *7th IEEE International Conference on Advanced Video and Signal-Based Surveillance (AVSS)*, August-September 2010.

K. Guo, **P. ISHWAR**, and **J. KONRAD**, "Action Recognition in Video by Sparse Representation on Covariance Manifolds of Silhouette Tunnels," *IEEE International Conference on Pattern Recognition (ICPR)*, August 2010.

Z. Wang, **M. G. KARPOVSKY**, and **A. JOSHI**, "Influence of Metallic Tubes on the Reliability of CNTFET SRAMs: Error Mechanisms and Countermeasures," *Association for Computing Machinery (ACM) Great Lakes Symposium on VLSI (GLSVLSI 2011)*, May 2011.

O. Keren, I. Levin, and **M. G. KARPOVSKY**, "Duplication Based One-To-Many Coding for Trojan Hardware Detection," *IEEE International Symposium on Defect and Fault Tolerance in VLSI Systems*, October 2010.

M. G. KARPOVSKY, "Design of Secure Hardware Resistant to the Attacks," *EW Design and Test Symposium*, September 2010.

Z. Wang and **M. G. KARPOVSKY**, "Robust FSMs for Cryptographic Devices Resilient to Strong Fault Injection Attacks," *16th IEEE International On-Line Testing Symposium*, July 2010.

M. Wang, **J. KONRAD**, **P. ISHWAR**, K. Jing, and H. Rowley, "Image Saliency: From Intrinsic to Extrinsic Context," *IEEE Computer Vision and Pattern Recognition (CVPR)*, June 2011.

P. R. KOTIUGA, "Whitney Form Discretization of Helicity Functionals and Applications," *10th International Workshop on Finite Elements for Microwave Engineering (FEM 2010)*, October 2010.

P. R. KOTIUGA, "Whitney Form Discretization of Helicity Functionals and Applications," *ACE '10 - 6th Workshop on Advanced Computational Electromagnetics*, July 2010.

L. B. LEVITIN and **T. TOFFOLI**, "Work Recoverable from Two-Particle Information," *10th International Conference on Quantum Communication, Measurement and Computation (QCMC 2010)*, July 2010.

T. D. C. LITTLE, A. Agarwal, J. Chau, M. Figueroa, A. Ganick, J. Lobo, T. Rich, and P. Schimitsch, "Directional Communication System for Short-Range Vehicular Communications," *2nd IEEE Vehicular Networking Conference*, December 2010.

S. Guo and **T. D. C. LITTLE**, "Throughput Estimation for Singleton Video Streaming Application Over Wireless Sensor Networks," *6th IEEE International Conference on Wireless Communications, Networking, and Mobile Computing (WiCOM 2010)*, September 2010.

A. M. Vegni and **T. D. C. LITTLE**, "A Message Propagation Model for Hybrid Vehicular Communications Protocols," *2nd International Workshop on Communication Technologies for Vehicles (Nets4Cars) at the 7th IEEE International Symposium on Communication Systems, Networks, and Digital Signal Processing (CSNDSP)*, July 2010.

Z. Wu and **T. D. C. LITTLE**, "Network Solutions for Non-LOS Problem of a New Free Space Optical System," *7th IEEE International Symposium on Communication Systems, Networks, and Digital Signal Processing (CSNDSP)*, July 2010.

M. K. MAZUMDER, et al., "Self-Cleaning Photovoltaic Panels with Integrated Transparent Electrodynamic Screens: Dust Adhesion and Removal Mechanisms," *The American Chemical Society 240th National Meeting*, August 2010.

T. D. MOUSTAKAS and A. Bhattacharyya, "Experimental Evidence that the Plasma-Assisted MBE Growth of Nitride Alloys is a Liquid Phase Epitaxy Process," *ECS Transactions: 219th ECS Meeting*, vol. 35, no. 6, pp. 63-71, May 2011.

C.-K. Kao, Y. Liao, C. Thomidis, A. Moldawer, D. Bhattarai, H.

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J. Henson, E. Dimakis, J. DiMaria, **T. D. MOUSTAKAS**, and **R. PAIELLA**, "Diffraction-Coupled Plasmon-Enhanced Light Emission from InGaIn/GaN Quantum Wells," *CLEO: 2011 - Laser Science to Photonic Applications*, May 2011.

F. Sudradjat, K. Driscoll, Y. Liao, A. Bhattacharyya, C. Thomidis, L. Zhou, D. J. Smith, **T. D. MOUSTAKAS**, and **R. PAIELLA**, "Experimental Observation of Sequential Tunneling Transport in GaIn /AlGaIn Coupled Quantum Wells Grown on Free-Standing GaIn," *Materials Research Society Symposium Proceedings*, January 2011.

Y. Liao, C. Thomidis, A. Bhattacharyya, C-k Kao, A. Moldawer, W. Zhang, and **T. D. MOUSTAKAS**, "Development of Milliwatt Power AlGaIn-Based Deep UV-LEDs by Plasma-Assisted MBE," *Materials Research Society Symposium Proceedings*, January 2011.

R. PAIELLA, K. Driscoll, Y. Li, Y. Liao, A. Bhattacharyya, C. Thomidis, L. Zhou, D. J. Smith, and **T. D. MOUSTAKAS**, "Intersubband Transitions in GaIn-Based Quantum Wells: a New Materials Platform for Infrared Device Applications," *SPIE*, August 2010.

C. J. De Luca, **S. H. NAWAB**, S. H. Roy, and F. Zaheer, "Adaptations in Motor Unity Activity with Aging," *Society for Neuroscience*, September 2010.

B. T. Cole, S. H. Roy, C. J. De Luca, and **S. H. NAWAB**, "Dynamic Neural Network Detection of Tremor and Dyskinesia from Wearable Sensor Data," *32nd Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, August-September 2010.

B. NAZER and R. D. Nowak, "Efficient Designs for Multiple Gene Knockdown Experiments," *2010 IEEE International Workshop on Genomic Signal Processing and Statistics (GENSIPS)*, November 2010.

J. Zhan, **B. NAZER**, O. Ordentlich, U. Erez, and M. Gastpar, "Integer-Forcing Architectures for MIMO: Distributed Implementation and SIC," *Asilomar 2010: 44th Annual Asilomar Conference on Signals, Systems, and Computers*, November 2010.

B. NAZER and S. C. Draper, "Gaussian Red Alert Exponents: Geometry and Code Constructions," *Allerton 2010: 48th Annual Allerton Conference on Communication, Control, and Computing*, September-October 2010.

B. NAZER and R. D. Nowak, "Sparse Interactions: Identifying High-Dimensional Multilinear Systems via Compressed Sensing," *Allerton 2010: 48th Annual Allerton Conference on Communication, Control, and Computing*, September-October 2010.

J. Zhan, **B. NAZER**, U. Erez, and M. Gastpar, "Integer-Forcing Linear Receivers: A New Low-Complexity MIMO Architecture," *IEEE Vehicular Technology Conference (VTC)*, September 2010.

J. Yin and **R. PAIELLA**, "Cascaded Interband/Intersubband Thermophotovoltaic Energy Conversion," *CLEO: 2011 Laser Science to Photonic Applications*, May 2011.

C. Boztug, F. Chen, J. R. Sanchez-Perez, F. F. Sudradjat, D. M. Paskiewicz, R. B. Jacobson, M. G. Lagally, and **R. PAIELLA**, "Direct-Bandgap Germanium Active Layers Pumped Above Transparency Based on Tensilely Strained Nanomembranes," *CLEO: 2011 Laser Science to Photonic Applications*, May 2011.

R. PAIELLA, K. Driscoll, Y. Liao, A. Bhattacharyya, L. Zhou, D. J. Smith, and **T. D. MOUSTAKAS**, "Short-Wavelength Intersubband Light Emission from Optically Pumped GaIn / AlIn Quantum Wells," *Materials Research Society Symposium Proceedings*, January 2011.

I. C. PASCHALIDIS and Y. Lin, "Mobile Agent Coordination via a Distributed Actor-Critic Algorithm," *MED 2011: The 19th Mediterranean Conference on Control and Automation*, June 2011.

R. Moazzez-Estanjini and **I. C. PASCHALIDIS**, "Improved Delay-Minimized Data Harvesting with Mobile Elements in Wireless Sensor Networks," *9th International Symposium on Modeling and Optimization in Mobile, Ad Hoc, and Wireless Networks (WiOpt '11)*, May 2011.

A. Savvides, M. C. Caramanis, and **I. C. PASCHALIDIS**, "Cyber-Physical Systems for Next Generation Intelligent Buildings,"

ACM/IEEE Second International Conference on Cyber-Physical Systems (ICCPS), April 2011.

I. C. PASCHALIDIS and R. Moazzez-Estanjini, "The Capacity of Sparse Ad Hoc Networks Under Controlled Mobility," *49th IEEE Conference on Decision and Control*, December 2010.

I. C. PASCHALIDIS, W. Lai, and F. Huang, "On Distributed Multiple Access Control for Wireless Sensor Networks," *Allerton 2010: 48th Annual Allerton Conference on Communication, Control, and Computing*, September-October 2010.

I. C. PASCHALIDIS and **C. G. CASSANDRAS**, "Wireless Sensor Networks for Localization and Coverage Control," Department of Energy (DOE) National Nuclear Security Administration (NNSA) University and Industry Technical Interchange Review Meeting, December 2010.

S. RAMACHANDRAN, "A Higher Mode of Sensing with Fibers," *Optical Fiber Sensors*, May 2011.

N. Bozinovic, P. Kristensen, and **S. RAMACHANDRAN**, "Long-Range Fiber-Transmission of Photons with Orbital Angular Momentum," *CLEO: 2011 Laser Science to Photonic Applications*, May 2011.

D. Schimpf, R. Barankov, K. Jespersen, and **S. RAMACHANDRAN**, "Optical Low-Coherence Interferometry for Reconstruction of the Modal-Content in Few-Mode Fibers," *CLEO: 2011 Laser Science to Photonic Applications*, May 2011.

P. Steinvurzel, K. Tantiwanichapan, M. Goto, and **S. RAMACHANDRAN**, "Diffraction Control of Bessel Beams Generated in Fiber," *CLEO: 2011 Laser Science to Photonic Applications*, May 2011.

D. N. Schimpf, R. A. Barankow, K. Jespersen, and **S. RAMACHANDRAN**, "Modal Content Reconstruction of Few-Mode Fibers by Using Optical Low-Coherence Interferometry," *SPIE Photonics West*, January 2011.

S. RAMACHANDRAN, "Doughnut Beams: Ramifications of Optical Vortices in Fibers," *Photonics 2010*, December 2010.

S. RAMACHANDRAN, "Physics and Applications of Optical Vortices in Fibers," *IEEE Lasers and Electro-Optics Society Annual Meeting*, November 2010.

S. RAMACHANDRAN, "Fiber Light Sources Using Structured Beams," *4th EPS-QEOD Europhoton Conference*, August-September 2010.

B. Orten, **V. SALIGRAMA**, et. al., "Sensing-Aware Classification with High-Dimensional Data," *International Conference on Acoustics, Speech and Signal Processing*, May 2011.

P. Jones, **V. SALIGRAMA**, and S. Mitter, "Probabilistic Belief Revision with Structural Constraints," *24th Annual Conference on Neural Information Processing Systems (NIPS)*, December 2010.

M. Zhao and **V. SALIGRAMA**, "Noisy Filtered Processes: Reconstruction and Compression," *49th IEEE Conference on Decision and Control*, December 2010.

P. Jones, S. Mitter, and **V. SALIGRAMA**, "Revision of Marginal Probability Assessments," *13th International Conference on Information Fusion (Fusion 2010)*, July 2010.

K. Trapeznikov, **V. SALIGRAMA**, and **D. A. CASTAÑÓN**, "Active Boosted Learning," *14th International Conference on Artificial Intelligence and Statistics*, April 2011.

J. Wang, **V. SALIGRAMA** and **D. A. CASTAÑÓN**, "Markov and Hidden Markov Model Group Testing," *Allerton 2010: 48th Annual Allerton Conference on Communication, Control, and Computing*, September-October 2010.

D. Montamed, V. Vazieri, **V. SALIGRAMA**, and **D. A. CASTAÑÓN**, "Decentralized Compressive Sensing," *Allerton 2010: 48th Annual Allerton Conference on Communication, Control, and Computing*, September-October 2010.

D. S. Simon and **A. V. SERGIENKO**, "Correlated Imaging with Aberration Cancellation," *International Conference on Quantum Information (ICQI)*, June 2011.

A. M. Fraine, R. Egorov, O. V. Minaeva, D. S. Simon, and **A. V. SERGIENKO**, "High Resolution Measurement of Polarization Mode Dispersion with Quantum Interferometry," *International Conference on Quantum Information (ICQI)*, June 2011.

A. V. SERGIENKO and D. S. Simon, "Correlated Imaging with Aberration Cancellation," *International Conference on Quantum Science and Technology*, May 2011.

D. S. Simon and **A. V. SERGIENKO**, "Twin-Photon Correlated Confocal Microscopy," *CLEO: 2011 Laser Science to Photonic Applications: Quantum Electronics and Laser Science Conference (QELS)*, May 2011.

D. S. Simon and **A. V. SERGIENKO**, "Correlated Imaging with Aberration Cancellation," *CLEO: 2011 Laser Science to Photonic Applications: Quantum Electronics and Laser Science Conference (QELS)*, May 2011.

A. V. SERGIENKO, D. Simon, and O. Minaeva, "Ghost Imaging with Aberration Cancellation," *SPIE Optics + Photonics*, August 2010.

A. V. SERGIENKO, N. Mohan, O. Minaeva, G. N. Goltsman, M. B. Nasr, B. Saleh, and **M. C. TEICH**, "Superconducting Photon-Counting Detectors in Optical Measurement and Biophotonics Applications," *SPIE Optics + Photonics*, August 2010.

M. Boyle, A. Klausner, **D. STAROBINSKI**, **A. TRACHTENBERG**, and H. Wu, "Poster Abstract: Gait-Based Smartphone User Identification," *9th International Conference on Mobile Systems, Applications, and Service (MobiSys 2011)*, June 2011.

N. Fazlollahi, **D. STAROBINSKI**, and **A. TRACHTENBERG**, "Connected Identifying Codes for Sensor Network Monitoring," *IEEE Wireless Communications & Networking Conference (WCNC)*, March 2011.

N. Fazlollahi, **D. STAROBINSKI**, and **A. TRACHTENBERG**, "Connecting Identifying Codes and Fundamental Bounds," *6th Information Theory and Applications Workshop*, February 2011.

M. Veeraraghavan and **D. STAROBINSKI**, "A Routing Architecture for Scheduled Circuit Services," *Association for Computer Machinery*, November 2010.

A. Kitt, J. Suk, S. Remi, S. Ahmed, R. Piner, K. Liechti, R. Ruoff, **A. K. SWAN**, and B. B. Goldberg, "Variable Strain in Graphene Sealed Micro Chambers Studied with Raman Spectroscopy," *American Physical Society Meeting*, March 2011.

S. Remi, **A. K. SWAN**, and B. B. Goldberg, "Raman Measurements of Graphene in Magnetic Fields," *American Physical Society Meeting*, March 2011.

S. Remi, A. Kitt, **A. K. SWAN**, B. B. Goldberg, B. Feldman, J. Mar-

tin, A. Yacoby, J. W. Suk, and R. S. Ruoff, "Barometrically and Electrostatically Induced Strain in Suspended Graphene," *XXII International Conference on Raman Spectroscopy*, August 2010.

H. Chen, C. Keasler, O. Ozsun, and **A. K. SWAN**, "Raman Spectra of High Aspect Ratio Double- and Single-Clamped Silicon Nanowires," *XXII International Conference on Raman Spectroscopy*, August 2010.

S. Remi, **A. K. SWAN**, and B. B. Goldberg, "High Magnetic Field Raman Spectroscopy of Electron Phonon Interactions in Graphene," *XXII International Conference on Raman Spectroscopy*, August 2010.

J. G. Duque, H. Chen, S. Kilina, S. Tretiak, A. Shreve, X. Tu, M. Zheng, **A. K. SWAN**, and S. K. Doorn, "Resonant Raman Spectroscopy of Chirality-Enriched Semiconducting Single Walled Carbon Nanotubes," *XXII International Conference on Raman Spectroscopy*, August 2010.

A. Yurt, G. G. Daaboul, X. Zhang, G. M. Hwang, B. B. Goldberg, and **M. S. ÜNLÜ**, "Widefield Interferometric Detection and Size Determination of Dielectric Nanoparticles," *23rd Annual Meeting of the IEEE Photonics Society*, November 2010.

M. S. ÜNLÜ, M. Chiari, and D. Bergstein, "Interferometric Reflectance Imaging Sensor (IRIS) Label-Free Protein and Single Pathogen Detection," *NanotechItaly*, October 2010.

Invited Lectures

H. ALTUG, "Integrated Plasmonics for Ultrasensitive Spectroscopy and Biodetection," *OSA Optical Sensors*, June 2011.

H. ALTUG, "Optofluidic-Nanoplasmonic Sensors for Biochemical Detection," *SPIE Defense, Security and Sensing*, April 2011.

H. ALTUG, "On-Chip Plasmonic Systems for Ultrasensitive Nanospectroscopy," *SPIE Defense, Security and Sensing*, April 2011.

H. ALTUG, "Metamaterials, Nanoplasmonics, and Nanofluidics for Ultrasensitive Spectroscopy and Biodetection," *Massachusetts Institute of Technology, Electrical Engineering and Computer Science, Optics and Quantum Electronics Seminar*, April 2011.

H. ALTUG, "Metamaterials, Nanoplasmonics, and Nanofluidics for Ultrasensitive Spectroscopy and Biodetection," *University of Texas at Austin*, April 2011.

H. ALTUG, "Metamaterials, Nanoplasmonics, and Nanofluidics for Ultrasensitive Spectroscopy and Biodetection," *Massachusetts Institute of Technology, Institute for Soldier Nanotechnologies*, March 2011.

H. ALTUG, "Metamaterials, Nanoplasmonics, and Nanofluidics for Ultrasensitive Spectroscopy and Biodetection," *Harvard University, Chemistry Department, Physical Chemistry Seminar*, March 2011.

H. ALTUG, "Merging Nanophotonics and Nanofluidics for Active Analyte Delivery and Biosensing," *BiOS SPIE Photonics West - Frontiers in Biological Detection: From Nanosensors to Systems*, January 2011.

H. ALTUG, "Integrated Plasmonic Systems for Ultrasensitive Biodetection," *SPIE Photonics West OPTO (Silicon Photonics Symposium)*, January 2011.

H. ALTUG, "Ultra-Sensitive SEIRA with Plasmonic Nanoantennas," *NANO META, European Society of Physics*, January 2011.

H. ALTUG, "Nanoplasmonic Systems for Ultrasensitive Biomolecular Identification," *Boston University Photonics Center Future of Light Symposium*, December 2010.

H. ALTUG, "Plasmonics Nanoantennas for Ultrasensitive Biomolecular Identification," *Materials Research Society (MRS) Fall Meeting*, December 2010.

H. ALTUG, "Nanoplasmonic Systems for Ultrasensitive Biomolecular Detection and Identification," *IEEE Photonics Society Annual Meeting*, November 2010.

H. ALTUG, "Integrated Plasmonic Systems for Ultrasensitive Biodetection," *Lehigh University*, October 2010.

H. ALTUG, "Nanoplasmonic Systems for Ultrasensitive Biomolecular Identification," *Boston University Material Science Division*, October 2010.

H. ALTUG, "Nanoplasmonics for Ultrasensitive Biomolecular De-

tection," *Worldwide Universities Network Summer School on "Nanotechnology for Healthcare"*, September 2010.

H. ALTUG, "Nanoplasmonics for Ultrasensitive Vibrational Spectroscopy and Bimolecular Detection," *SPIE NanoScience + Engineering Conference*, August 2010.

H. ALTUG, "Plasmonics for Ultrasensitive Biomolecular Nanospectroscopy," *2011 International Conference on Optical MEMS & Nanophotonics*, August 2010.

E. BELLOTTI, M. Moresco, and F. Bertazzi, "Theory of High Field Carrier Transport and Impact Ionization in III-Nitride Semiconductors," *14th International Workshop on Computational Electronics*, October 2010.

E. BELLOTTI, "Computational Electronics of Electronic Materials and Devices: From the Microscopic Physics to Device Performance," *Multiscale Multidisciplinary Modeling of Electronic Materials Workshop*, September 2010.

I. BIGIO, "The Emerging Field of Neurophotonics," *Engineering Conferences International (ECI): Optical Technologies in Medicine and Biology*, June 2011.

I. BIGIO, "Monitoring of Apoptosis in Viable Cells with Elastic Scattering Spectroscopy," *BioPhotonics and Imaging Conference (BioPIC)*, October 2010.

R. BROWER, "Strongly Interacting Gauge Theories for EW Symmetry Breaking," *Miami*, December 2010.

R. BROWER, "Progress on Disconnected Diagrams," *MIT Lattice Club*, October 2010.

C. G. CASSANDRAS, "Preprint Servers and How They Can Coexist with Traditional Publishers," *IEEE-CSS Sponsored Panel Discussion*, December 2010.

C. G. CASSANDRAS, "Joys and Perils of Automation," *NSF Workshop on "Ideas and Technology of Systems"*, December 2010.

C. G. CASSANDRAS, "Distributed Coverage Control and Data Collection with Mobile Sensor Networks," *49th IEEE Conference on Decision and Control*, December 2010.

C. G. CASSANDRAS, "A Stochastic Hybrid System View at a

Class of Non-Cooperative Games," *IEEE 26th Convention of Electrical and Electronics Engineers in Israel*, November 2010.

C. G. CASSANDRAS, "Cooperative Control and Optimization in an Uncertain Asynchronous Wireless Networked World," *University of Cyprus*, November 2010.

C. G. CASSANDRAS, "Cooperative Control and Optimization in an Uncertain Asynchronous Wireless Networked World," *George Mason University*, October 2010.

C. G. CASSANDRAS, "Perturbation Analysis and Optimization of Stochastic Hybrid Systems," *Colorado State University*, October 2010.

C. G. CASSANDRAS, "Cooperative Control and Optimization in an Uncertain Asynchronous Wireless Networked World," *Colorado State University*, October 2010.

C. G. CASSANDRAS, "Cooperative Control and Optimization in an Uncertain Asynchronous Wireless Networked World," *7th International Conference on Electrical Engineering, Computing Science, and Automatic Control*, September 2010.

C. G. CASSANDRAS, "Perturbation Analysis and Optimization of Stochastic Hybrid Systems and Resource Contention Games," *Center for Research and Advanced Studies of the National Polytechnic Institute (CINVESTAV)*, September 2010.

C. G. CASSANDRAS, "Cooperative Control and Optimization in an Uncertain Asynchronous Wireless Networked World," *Universidad de los Andes*, August 2010.

D. CASTAÑÓN, "A Random Set Framework for Object Recognition, Data Fusion and Control of Active Sensing," *Pacific Northwest National Laboratory*, June 2011.

D. CASTAÑÓN, "Distributed Task Partitioning in ISR Missions," *Air Force Office of Scientific Research (AFOSR) Dynamics and Control Meeting*, June 2011.

D. CASTAÑÓN, "Games, Information and Deception Exploitation for Adversarial Network Systems," *Air Force Office of Scientific Research (AFOSR) Dynamics and Control Meeting*, June 2011.

D. CASTAÑÓN, "Advanced Imaging Systems for Security Applications," *Northeastern University*, March 2011.

D. CASTAÑÓN, "Stochastic Network Attack Games," *University of California, San Diego*, October 2010.

D. CASTAÑÓN, "Task Partitioning and Human Supervision in ISR Missions," *Defense Research & Engineering (DDR&E) and Air Force Office of Scientific Research (AFOSR) Multidisciplinary University Research Initiative (MURI) meeting*, August 2010.

A. K. COSKUN, "Software-Level Thermal Management for High-Performance Architectures," *Microscale Heat Transfer Summer School, École Polytechnique Fédérale de Lausanne (EPFL)*, Switzerland, June 2011.

A. K. COSKUN, "Efficient Evaluation and Management of Temperature and Reliability in Multiprocessor Systems," *Sandia National Laboratories, Computer Science Research Institute*, Albuquerque, New Mexico, April 2011.

A. K. COSKUN, "Optimizing the Software Stack for Energy Efficient Computing," *Center for Computational Science (CCS)*, Boston University, March 2011.

A. K. COSKUN, "Energy-Efficient Thermal Management for High-Performance Multiprocessor Systems," *IBM Austin Research Center*, December 2010.

A. K. COSKUN, "Intelligent Runtime Management for Enabling Energy-Efficient, Reliable, and High-Performance Computing," *Oracle*, November 2010.

A. K. COSKUN, "Manufacturing, CAD and Thermal-Aware Architectures for 3-D MPSoCs," *International Conference on Computer-Aided Design (ICCAD)*, November 2010.

A. K. COSKUN, "Energy-Efficient Temperature Management for High Performance Multiprocessor Systems," *IBM T. J. Watson Research Center*, August 2010.

L. DAL NEGRO, "Engineering Aperiodic Order in Nanoplasmonics," *European Laboratory for Non-Linear Spectroscopy (LENS)*, May 2011.

L. DAL NEGRO, "Broadband Nanoplasmonics: Enhancing Light-Matter Coupling at the Nanoscale," *U. S. Army Natick Soldier RD&E Center*, April 2011.

L. DAL NEGRO, "Photons in a Labyrinth: Challenges & Opportu-

nities of Aperiodic Nanophotonics," *University of Toronto*, March 2011.

L. DAL NEGRO, "Aperiodic Order for Energy Harvesting," *Harvesting & Manipulating Light at the Nanoscale Workshop, Molecular Foundry*, September-October 2010.

L. DAL NEGRO, "Photons in a Labyrinth: Challenges & Opportunities of Aperiodic Nanophotonics," *Brown University*, September 2010.

L. DAL NEGRO, "Engineering Light Localization on a Silicon Chip," *7th International Workshop on Disordered Systems*, September 2010.

L. DAL NEGRO, "Engineering Aperiodic Order for Optical Devices with Photonic-Plasmonic Nanostructures," *SPIE Nanoscience + Engineering*, August 2010.

D. DENSMORE, "Tools for Synthetic Biology," *Synthetic Biology 5.0 (SB5.0)*, Stanford, California, June 2011.

D. DENSMORE, "EDA to BDA," *Boston University Computer Science Department Lecture Series*, October 2010.

D. DENSMORE and T. Porter, "Graduate School," *NSBE Zone 1 Conference*, October 2010.

D. DENSMORE, "EDA to BDA," *Boston University Biomedical Engineering Department Lecture Series*, September 2010.

D. DENSMORE, "EDA to BDA," *Wellesley College*, September 2010.

R. GILES, Department of Energy, *Computational Science Graduate Fellows Meeting*, September 2010.

M. HERBORDT, "FPGA Acceleration of Molecular Dynamics and Docking," *Bio-Molecular Simulations on Future Computing Architectures*, Oak Ridge National Laboratory, September 2010.

P. ISHWAR, "Action Recognition in Covariance Manifolds," *ECE Department Graduate Seminar Series, Worcester Polytechnic Institute (WPI)*, February 2011.

P. ISHWAR, "Action Recognition in Covariance Manifolds," *ECE Department Colloquium, Tufts University*, January 2011.

W. C. KARL, "Object-Based Tomography for Joint Segmentation and Reconstruction," *Tomography in Materials Science Workshop*, December 2010.

M. G. KARPOVSKY, "Design of Secure Hardware," *Saint Petersburg State University*, September 2010.

M. G. KARPOVSKY, "Routing in Computer/Communication Networks," *Saint Petersburg State Polytechnical University*, September 2010.

M. G. KARPOVSKY, "Computer Hardware Resistant to Side-Channel Attacks," *Saint Petersburg State Electrotechnical University*, September 2010.

J. KONRAD, "VIDEOPSY: Towards Autonomous Video Surveillance," *Media Lab, Massachusetts Institute of Technology*, March 2011.

J. KONRAD, "VIDEOPSY: Enabling Technology for Camera Webs," *Koc University*, August 2010.

L. B. LEVITIN, "Fundamental Physical Capabilities and Limitations in Communication and Computing," *Foundations of Probability and Physics-6 (FPP6)*, June 2011.

T. D. C. LITTLE, "Ubiquitous Networking for Human Containers," *NSF Workshop on Pervasive Computing at Scale (PeCS)*, January 2011.

M. K. MAZUMDER, "Self-Cleaning Solar Panels and Solar Concentrators," *Invited Web-Based Presentation to the Renewable Energy Group of King Abdullah University of Science and Technology (KAUST)*, June 2011.

M. K. MAZUMDER et. al., "Photoelectrochemical Hydrogen Production," *2011 Hydrogen and Fuel Cells Program of the Department of Energy (DOE) Annual Meeting*, May 2011.

M. K. MAZUMDER, "Electrodynamic Removal of Dust from Solar Panels: Effect of Surface Mass Density, Microstructural Deposition Pattern, and Adhesion of Dust on PV Performance," *Symposium on Green Energy at the 34th Annual Meeting of the Adhesion Society*, February 2011.

M. K. MAZUMDER, "Self-Cleaning Solar Panels and Solar Concentrators: Development and Applications," *3M Corporate Research Center, St. Paul, Minnesota*, January 2011.

M. K. MAZUMDER, "Self-Cleaning Solar Panels and Solar Concentrators: Development and Applications," *DuPont Experimental Stations, Central Research and Development*, December 2010.

M. K. MAZUMDER, "Stability, Dispersion Efficiency and Consistency of Respiratory Drug Delivery: Challenges in Product Optimization, Characterization, and Performance Evaluation," *American Association for Pharmaceutical Scientists (AAPS), 2010 AAPS Inhalation and Nasal Technology Focus Group (INTFG) Fall Symposium on Particle Engineering for Orally Inhaled Drug Products*, September 2010.

J. Stark, **M. K. MAZUMDER**, **M. N. HORENSTEIN**, R. Sumner, P. Girouard, O. Sadler, and K. A. Gopalkrishnan, "Electrostatic Charging of Particles on Electrodynamic Screens (EDS) by Low Frequency Electric and Dielectrophoretic Excitations," *2011 Annual Meeting of the Electrostatics Society of America*, May 2011.

T. MORSE, *Workshop on Next-Generation Optical Fiber Technology*, October 2010.

T. D. MOUSTAKAS, "Nitride Semiconductors and Their Optoelectronic Applications," *Army Research Laboratory*, June 2011.

T. D. MOUSTAKAS, "Experimental Evidence that the Plasma-Assisted MBE Growth of Nitride Alloys is a Liquid Phase Epitaxy Process," *219th Electrochemical Society Meeting*, May 2011.

T. D. MOUSTAKAS, "Nitride Semiconductors - Why They Work," *Princeton University*, April 2011.

T. D. MOUSTAKAS, "Nitride Semiconductors and Their Applications to Solid State Lighting and Water/Air Purification," *2011 College of Engineering Distinguished Scholar Lecture, Boston University*, March 2011.

T. D. MOUSTAKAS, "Nitride Semiconductors and their Optoelectronic Applications," *Colloquium at Columbia University*, November 2010.

T. D. MOUSTAKAS, "The Development of Nitride Semiconductors by MBE," *The 2010 MBE Innovator Award Presentation at the 27th North American Conference on Molecular Beam Epitaxy*, September 2010.

T. D. MOUSTAKAS, D. J. Smith, L. Zhou, and M. R. McCartney, "Structural Characterization of III-Nitride Materials and Devices." *SPIE Optics + Photonics*, August 2010.

T. D. MOUSTAKAS, C. Thomidis, Y. Liao, and C-K Kao, "Nitride Based UV Emitters and Their Applications," *7th International Conference on Nanoscience & Nanotechnologies (NN10)*, July 2010.

B. NAZER, "Harnessing Interference for Reliable Computation and Communication," *Bell Labs, Enabling Computing Technologies Colloquium*, March 2011.

B. NAZER, "Harnessing Interference for Reliable Computation and Communication," *Massachusetts Institute of Technology, Signals, Information, and Algorithms Group Meeting*, March 2011.

B. NAZER, "The AWGN Red Alert Problem," *University of California, San Diego, 6th Annual Information Theory and Applications Workshop*, February 2011.

B. NAZER, "Harnessing Interference for Reliable Computation and Communication," *University of Illinois*, September 2010.

R. PAIELLA, "Device Physics and Applications of Intersubband Transitions in Wide-Bandgap Nitride Semiconductors," *University of Wisconsin-Madison*, October 2010.

R. PAIELLA, K. Driscoll, Y. Li, Y. Liao, A. Bhattacharyya, C. Thomidis, L. Zhou, D. J. Smith, and **T. D. MOUSTAKAS**, "Intersubband Transitions in GaN-Based Quantum Wells: A New Materials Platform for Infrared Device Applications," *SPIE Optics + Photonics*, August 2010.

I. C. PASCHALIDIS, "Optimization Techniques for Protein Docking," *Department of Computer Science and Telecommunications, University of Athens*, January 2011.

I. C. PASCHALIDIS, "Anomaly Detection for Data Security and Algorithms for Disease Prevention and Management," *EMC Corporation-Boston University Meeting*, January 2011.

I. C. PASCHALIDIS, "AIRFOILS: Real-Time Optimization for Animal Inspired Agile Flight," *Office of Naval Research (ONR) Multi-disciplinary University Research Initiative (MURI) Kickoff Meeting, University of Washington*, October 2010.

S. RAMACHANDRAN, "A Higher Mode of Sensing with Fibers," *Optical Fiber Sensors*, May 2011.

S. RAMACHANDRAN, "Doughnut Beams: Ramifications of Optical Vortices in Fibers," *Photonics 2010*, December 2010.

- S. RAMACHANDRAN**, "Physics and Applications of Optical Vortices in Fibers," *IEEE Lasers and Electro-Optics Society Annual Meeting*, November 2010.
- S. RAMACHANDRAN**, "Non-Zero-Order Light: Beams That Can Do What Gaussians Cannot," *MIT Optics and Electronics Seminar*, October 2010.
- S. RAMACHANDRAN**, "Making Light of $M^2 \neq 1$: Fiber Sources with Spatial Singularities," *Workshop on Next Generation Optical Fiber Technology*, October 2010.
- S. RAMACHANDRAN**, "Fiber Light Sources Using Structured Beams," *4th EPS-QEOD Europhoton Conference*, August-September 2010.
- V. SALIGRAMA**, "Spectrum Enforcement in Cognitive Radios," *NSF Workshop*, June 2011.
- V. SALIGRAMA**, "Anomaly Detection with Applications to Video Analysis," *MIT Local Initiatives Support Corporation (LISC) Seminar*, May 2011.
- V. SALIGRAMA**, "Video Analytics: A Statistical Approach," *National Geospatial Agency Brown Bag Seminar*, March 2011.
- V. SALIGRAMA**, "Token Based Algorithm for Distributed Computation in Sensor Networks," *INFORMS (Institute for Operations Research and the Management Sciences) Annual Meeting*, November 2010.
- V. SALIGRAMA**, "Video Analytics," *NGA Research Symposium*, September 2010.
- J. SEMETER**, "On the Model-Data Convergence in Optical Aeronomy," *Fall Meeting of the American Geophysical Union (AGU)*, December 2010.
- J. SEMETER**, "Introduction to Remote Sensing of the Aurora Borealis," *Advanced Modular Incoherent Scatter Radar (AMISR) Summer School, MIT Haystack Observatory*, July 2010.
- A. V. SERGIENKO**, "Dispersion and Aberration Cancellation with Entangled Photons," *INFN and Department of Physics Special Colloquium, University of Bari, Italy*, April 2011.
- A. V. SERGIENKO**, "Dispersion and Aberration Cancellation with Entangled Photons," *Department of Engineering of Informatics (DEI), University of Padova, Italy*, November 2010.
- A. K. SWAN**, "Energy Dissipation Mechanisms in Carbon Nanotubes," *New York Chapter of the American Physical Society*, April 2011
- A. K. SWAN**, "Optical Excitation and Energy Dissipation in Carbon Nanotubes," *23rd International Winterschool on Electronic Properties of Novel Materials: Molecular Nanostructures*, Kirchberg, Austria, February 2011.
- A. K. SWAN**, "Optics of Carbon Nanotubes and Graphene," *Denison University*, January 2011.
- A. K. SWAN**, "Optics of Low Dimensional Carbon - Carbon Nanotubes and Graphene," *Physical Chemistry Seminar*, Boston University, October 2010.
- M. C. TEICH**, "Heart Rate Variability," *Sixth All-Russian Symposium on Heart Rate Variability and Slow Oscillation Processes in Humans*, May 2011.
- M. C. TEICH**, "Multi-Photon and Entangled-Photon Imaging and Lithography," *Boston Chapter of IEEE Photonics Society, Photonics Imaging Workshop, MIT Lincoln Laboratory*, March 2011.
- A. TRACHTENBERG**, "Non-Trivial Applications of Trivial Codes," *Bar-Ilan University, CS colloquium*, May 2011.
- A. TRACHTENBERG**, "Concrete Cybersecurity," *GM Research*, May 2011.
- A. TRACHTENBERG**, "Identifying Codes: From Theory to Practice ... and Back Again," *Tel Aviv Electrical Engineering Colloquium*, May 2011.
- A. TRACHTENBERG**, "Reconciliation of Distributed Data," *Ben Gurion University, CS colloquium*, May 2011.
- A. TRACHTENBERG**, "Smartphone Security Through Gait Analysis," *InfraGard*, November 2010.
- M. S. ÜNLÜ**, M. Chiari, and D. Bergstein, "Interferometric Reflectance Imaging Sensor (IRIS) Label-Free Protein and Single Pathogen Detection," *NanotechItaly*, October 2010.

Patents and Patent Disclosures

H. ALTUG, M. Huang, A. Artar, and A. A. Yanik, "Nanostructure Biosensors and Systems and Methods of Use Thereof," Boston University reference no.: BU09-64 and BU10-324.

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A. Sharon, S. Singh, **I. BIGIO**, S. Atladottir, D. Foss, and P. Vogtel, "Low Cost Disposable Medical Forceps to Enable a Hollow Central Channel for Various Functionalities," U. S. patent application no. 20110060188, March 10, 2011.

A. K. COSKUN and K. C. Gross, "Managing the Performance of a Computing System," U. S. patent no. 7890298, February 15, 2011.

Y. Liao and **T. D. MOUSTAKAS**, "High Efficiency Ultraviolet Light Emitting Diodes with Band Structure Potential Fluctuations," patent application no: PCT/US2011/34724, May 2, 2011.

T. D. MOUSTAKAS, "Semiconductor Device Having Highly Insulating Monocrystalline Gallium Nitride Thin Films," Japanese patent no. 4716526, April 8, 2011.

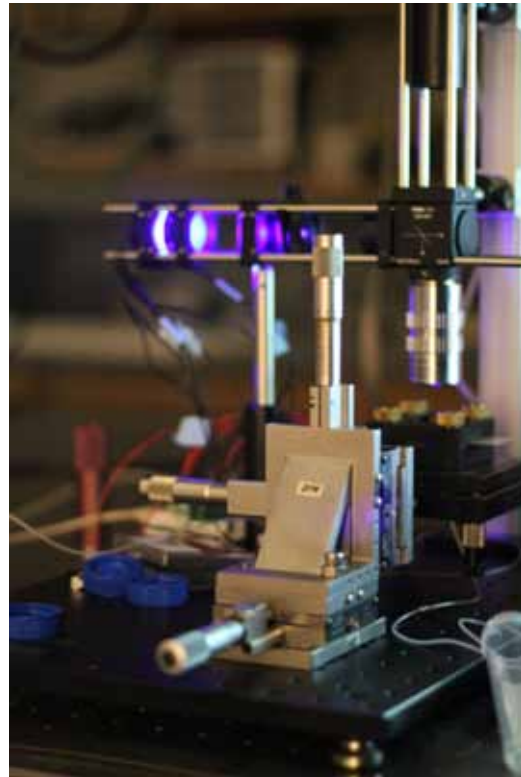
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S. RAMACHANDRAN, "Phase-Engineered Fibers for Use in Generating Cylindrical Vector Beams," U. S. patent application no. 20100303402, May 10, 2011.

S. RAMACHANDRAN, "Pumping in a Higher-Order Mode That is Different from a Signal Mode," U. S. patent no. 7925128, April 12, 2011.

S. RAMACHANDRAN, M. Sumetsky, and P. S. Westbrook, "Lo-



cally Perturbed Optical Fibers for Mode Transformers," U. S. patent no. 7865045, January 4, 2011.

J. W. Nicholson and **S. RAMACHANDRAN**, "Visible Continuum Generation Utilizing a Hybrid Optical Source," U. S. patent no. 7826499, November 2, 2010.

P. Kristensen, J. W. Nicholson, **S. RAMACHANDRAN**, and A. D. Yablon, "Measuring Modal Content of Multi-Moded Fibers," U. S. patent no. 7817258, October 19, 2010.

Research Areas and Laboratories

The ECE Department has three overlapping areas of research:

- » **Electrophysics:** photonics, solid state materials and devices, and electromagnetics and space physics;
- » **Information Sciences & Systems:** signal and image processing, and control and communication networks;
- » **Computer Systems Engineering:** hardware, software applications, and computer and communication networks.

Biomedical Optics

Bigio

The focus of research is the development of minimally-invasive diagnostics and therapeutic tools based on optical technologies.

Some of its ongoing projects include:

- » Optical biopsy: development of tools to measure non-invasively the reflectance spectrum of biological tissues to diagnose diseases such as cancer
- » Optical pharmacokinetics: development of a system that measures drug concentration in tissue in a non-invasive manner; the benefits will be observed in the ability to determine the optimum type and dosage of novel (light activated) chemotherapy drugs and in the dramatic reduction in the number of animals required for drug studies
- » Sensors to monitor the response of tumors to specific treatments
- » Optical methods for noninvasive imaging of neuronal activation and brain function
- » Optical methods for identifying different types of infectious agents

Center for Integrating Design Automation Research

Densmore

The Center for Integrating Design Automation Research (CIDAR) at Boston University looks at ways to integrate automation techniques into disciplines not traditionally defined by rigorous design automation methodologies. Automation will introduce concepts such as abstraction, standardization, mathematical formalism, and design tool integration. Specifically it is an interdisciplinary research center bringing expertise into areas such as:

- » Synthetic biology - the disciplined engineering of novel biological systems from well characterized biological building blocks
- » Cyber physical systems - networks of elements that interact with the physical environment via input and output

mechanisms. Communication, coordination, and computation must interact closely while being separated during the design process

CIDAR has computational research carried out in the Department of Electrical and Computer Engineering and experimental research carried out in the Center for Advanced Biotechnology (CAB) in the Department of Biomedical Engineering. CIDAR is the academic support mechanism for both the Clotho and Eugene projects.

Complex BioSignal Processing

Nawab

Complex Signal Processing is an umbrella term used to describe processes that act upon signals in order to achieve desired objectives. The term is purposely meant to subsume what is traditionally meant by signal processing, signal analysis, signal modeling, signal classification, and signal recognition, but it is also meant to be inclusive of signal interpretation, signal understanding, signal data mining, signal forensics, signal visualization, etc. Complex signal processing research at ECE encompasses the conceptualization, formalization, implementation, and evaluation of signal computing with an emphasis on applied artificial intelligence and biosignal applications.

Computer Architecture and Automated Design

Herbordt

Research by the Computer Architecture and Automated Design Lab begins with computer architecture, which the group defines (very broadly) as the application of technology to solve problems in data processing. Their particular focus is on applications that are likely to benefit from hardware solutions other than commodity systems. Their current primary interest is in the use of FPGAs as computational coprocessors to solve problems in bioinformatics and computational biology (BCB). There are two aspects to this work: demonstrating the benefits of FPGA computation with respect to particular problems in BCB and creating a software environment to allow transparent application development.

As with most projects in experimental computer systems, theirs requires integration of disparate disciplines within computer science and engineering. For them, these include computer architecture, design automation, circuit design, HL and HD languages and compilers, mapping and portability, algorithms, and applica-

tion analysis.

Control of Discrete Event Systems (CODES) Lab

Cassandras

The Control of Discrete Event Systems (CODES) Laboratory involves faculty and graduate students from the Division of Systems Engineering and operates within the Center for Information and Systems Engineering (CISE). Members of CODES conduct research on modeling, design, analysis, performance evaluation, control, and optimization of a variety of discrete event and hybrid systems – Communication and Sensor Networks, Manufacturing, Transportation, and Command/Control. CODES Lab activities cover a wide spectrum, from basic research to the development of software tools. These activities include:

- » Design and real-time control of communication and sensor networks, manufacturing systems and transportation systems
- » Decision support systems for quality-of-service guarantees or optimal performance
- » Software testing and verification
- » Strategic planning: getting information to decision makers fast and in a comprehensive form
- » Developing a new generation of concurrent and parallel simulation tools
- » New methods for cooperative control of wirelessly networked devices
- » Autonomously reconfigurable systems

Functorial Electromagnetics

Kotiuga

The Functorial Electromagnetic Analysis Lab considers the difficulties encountered in the finite element analysis of three-dimensional electromagnetic fields that cannot be anticipated through experience with two-dimensional simulations. The lab has focused its efforts in the development of Whitney form techniques, homology calculations, algorithms for total magnetic scalar potentials in multiply-connected regions, helicity functional techniques, and data structures based on semi-simplicial objects. Torsion invariants of complexes and rational homotopy theory are currently being exploited in the context of direct and inverse three-dimensional problems such as impedance tomography and magnetic field synthesis.

Integrated Circuits and Systems Lab

Joshi

The research of the Integrated Circuits and Systems Group focuses on various aspects (power, performance, area and reli-

ability) of designing VLSI systems. This research group adopts a cross-cut level-transparent approach, where they jointly explore the design space of devices, circuits, and architectures. Current projects include run-time management of manycore systems; reliable and secure VLSI nanosystems; plastic neuromorphic hardware for autonomous navigation in mobile robots; and integrated photonic networks for manycore systems.

Integrated Nanophotonics & Biosensing Systems (LINBS)

Altug

The Integrated Nanophotonics & Biosensing Systems (LINBS) laboratory is developing ultra-sensitive spectroscopy and sensing technologies for real-time, label-free and high-throughput detection and analysis of very low quantities of biomolecules. The lab employs a variety of nanophotonic technologies including nanoplasmonics and metamaterials. Researchers integrate on-chip sensor technologies with micro/nanofluidic systems for efficient analyte trapping and manipulation. The lab introduces new fabrication schemes that can enable high-throughput fabrication of its technologies at low costs over large areas. In addition to bio-chemical sensing and spectroscopy, lab researchers also investigate nanophotonics to develop devices for on-chip optical communications. Current projects include ultrasensitive vibrational nanospectroscopy of proteins, targeted delivery of analytes with subwavelength nanofluidics, advanced nanofabrication, nanoplasmonics, a high-throughput biosensor integrated with microfluidics, and nano/bio patterning.

Multi-Dimensional Signal Processing

Karl

The MDSP Lab conducts research in the areas of multidimensional and multi-resolution signal and image processing and estimation, and geometric-based estimation. The applications that motivate this research include, but are not limited to, problems arising in automatic target detection and recognition, geophysical inverse problems (such as finding oil and analyzing the atmosphere), and medical estimation problems (such as tomography and MRI). The general goal is to develop efficient methods for the extraction of information from diverse data sources in the presence of uncertainty. The lab's approach is based on the development of statistical models for both observations, prior knowledge, and the subsequent use of these models for optimal or near-optimal processing.

Multimedia Communications

Little

The Multimedia Communications Laboratory (MCL) at Boston

University focuses on topics in ubiquitous distributed computing. The lab's legacy work is in the area of distributed multimedia information systems emphasizing time-dependent and continuous media data such as video. Recent work targets mobile ad hoc networks (MANETs) and sensor networks (SNETs).

Nanomaterials and Nanostructure Optics

Dal Negro

The control of nanomaterials, structures and optical fields lies at the heart of the current nanotechnology revolution and offers unprecedented opportunities to enable novel functional elements at the nanoscale. Current research activities are related to electron-beam nanofabrication, materials synthesis, optical characterization and computational modelling of light-emitting silicon nanostructures, deterministic aperiodic and fractal plasmonic arrays and bio-compatible photonic structures.

Nanostructured Fibers and Nonlinear Optics

Ramachandran

Light beams in free space travel at the "speed of light" and tend to diverge (diffract). Complex, nano-structured fibers and waveguides can be used to slow light (confine photons in time) and counteract diffraction (by confining photons in space). Some confinement geometries lead to spatially complex beams that possess intriguing properties such as the ability of optical vortices to carry orbital angular momentum or the ability of Bessel beams to self-heal. Our group studies the myriad phenomena encountered by the manipulation of photons, with the aim of developing next generation applications of light, such as sensing, laser ranging and directed energy, imaging and microscopy, and quantum cryptography and communications.

Network Optimization and Control

Cassandras, Paschalidis

Research deals with fundamental aspects of optimizing the design and operation of networks as well as designing control algorithms to regulate their operation. Networks are pervasive in a variety of application domains, from computer, communication, and sensor networks to supply chains, distribution networks, and biological networks like protein interaction and metabolic networks. Recent research topics include transmission scheduling in wireless networks, optimal deployment of networks of mobile agents, network routing, network anomaly detection, pricing and resource allocation, network simulation, intelligent warehouse management, protein docking, and optimization of metabolic networks.

Networking and Information Systems

Starobinski, Trachtenberg

The Laboratory of Networking and Information Systems (NISLAB) is involved in providing novel perspectives to modern networking with emphasis on scalability, heterogeneity, and performance. Their research roots are in the mathematical fields of graph theory and algorithms, probability and stochastic processes, and coding theory with applications to security, content synchronization, network monitoring, wireless spectrum management, and advanced networking for scientific applications.

Optical Characterization and Nanophotonics

Goldberg, Ünlü, Swan

Research in the Optical Characterization and Nanophotonics (OCN) Laboratory focuses on developing and applying advanced optical characterization techniques to the study of solid-state and biological phenomena at the nanoscale. The lab is made up of an interdisciplinary group of faculty, graduate and undergraduate students, and visitors including guest faculty, students, and often high school students and teachers working on a broad range of research projects. The laboratory has a vertically integrated structure where researchers ranging from high school students to senior professors work together on truly interdisciplinary research topics.

Nanophotonics addresses a broad spectrum of optics on the nanometer scale covering technology and basic science. Compared to the behavior of isolated molecules or bulk materials: the behavior of nanostructures exhibits important physical properties not necessarily predictable from observations of either individual constituents or large ensembles. Current projects include development of high-resolution subsurface imaging techniques based on numerical aperture increasing lens (NAIL) for the study of semiconductor devices and circuits and spectroscopy of quantum dots; optical characterization of carbon nanotubes; biosensors based on microring resonators; and development of new nanoscale microscopy techniques utilizing interference of excitation as well as emission from fluorescent molecules. In addition to microscopy, optical resonance is nearly ubiquitous in our research projects including the development of resonant cavity enhanced photodetectors and imaging biosensors for DNA and protein arrays.

Performance and Energy-Aware Computing Laboratory (PeaLab)

Coskun

PeaLab's research interests lie in the broad areas of computer

architecture and embedded systems, with a particular focus on energy efficiency and thermal challenges in computing systems. Current projects include software optimization for green computing; thermal modeling and management of 3D stacked architectures (including systems with liquid cooling); and runtime management of manycore systems.

Quantum Communication and Measurement

Sergienko

Research in the Quantum Communication & Measurement (QCM) Laboratory focuses on fundamentals of quantum optics and quantum information processing with the purpose of developing quantum-optical communication networks and engineering novel ultra-precise measurement techniques in nano-photonics and life sciences that outperform conventional solutions.

Major research interests of the QCM Laboratory include:

- » Quantum information processing, quantum communication and cryptography, quantum networking, and linear-optical quantum computing;
- » Quantum communication and networking at the nanoscale, novel applications of collective excitations, surface plasmons, photonics bandgap structures, and metamaterials;
- » Quantum state engineering using parametric amplification in specially designed periodically polled nonlinear structures, entanglement manipulation and processing on a chip, micro- and nano-photonics, and ultrafast quantum optics;
- » Dispersion cancellation and management and super-resolution phase sensors;
- » Quantum and correlation imaging, aberration-free imaging and microscopy in life sciences;
- » High-performance single-photon detection and correlation measurement in a wide spectral range from ultraviolet to mid-infrared and terahertz;
- » Quantum bio-photonics: novel approaches to optical characterization and diagnostic of biological materials and devices using quantum states of light including visible and infrared fluorescent correlation spectroscopy (FCS);
- » Ultra-precise optical measurement in science and technology (quantum metrology) and characterization of organic, polymer, and semiconductor structures used in modern nano-photonics and optoelectronics; and
- » Precise measurement of polarization and chromatic dispersion in elements of 40Gb/s and 100 Gb/s metropolitan telecommunication networks.

Reliable Computing Laboratory

Karpovsky, Levitin, Joshi

Members of the laboratory conduct research on a broad variety of topics, including the design of computer chips; efficient hardware testing at chip, board, and system levels; functional software testing; efficient signal processing algorithms; coding and decoding; the design of time-efficient systolic arrays; and asynchronous circuits. Current projects include the design of reliable CNT NANO devices, routing policy development, and hardware security.

Semiconductor Photonics

Paiella

Research by the Semiconductor Photonics laboratory is aimed at the development of novel optoelectronic devices based on artificially-structured material systems, whose properties can be tailored by design to meet specific applications in a way that is not afforded by simply using bulk materials. One important example is that of semiconductor quantum structures, in which nanoscale layers (or wires or dots) of different semiconductor materials are assembled to create an energy landscape in which electrons behave in a markedly quantum-mechanical fashion. By controlling the dimensions and geometry of these structures, one can tune their most basic electronic and optical properties to enable entirely new device concepts – an approach that has become known as bandgap engineering. Heterostructures involving materials with different optical properties (e.g. metals and dielectrics) can also be designed in a similar manner and used to control the flow of light and its interaction with the underlying matter in novel and often useful ways.

Using this general approach, the research group is investigating several device concepts to address a wide range of applications, literally spanning three orders of magnitude in optical wavelength. These include: light sources tunable by design over a broad portion of the mid- and far-infrared spectrum, including wavelengths currently not accessible with any other semiconductor technology; nonlinear all-optical switching devices for future ultrafast fiber-optic communications; high-efficiency surface-plasmon-enhanced visible LEDs for solid state lighting; and ultraviolet optical modulators based on the quantum confined Stark effect. Our research in these areas involves both theoretical and experimental activities, including design and simulations (often based on the proverbial particle-in-a-box problem of quantum mechanics), device fabrication, and electrical and optical characterization.

Visual Information Processing

Konrad, Ishwar

The VIP Laboratory provides computational and visualization infrastructure for research in the area of next-generation visual information processing. The topics of interest include: retrieval, analysis, compression, and transmission of visual information, whether in the form of still images, video sequences, or 3D data. Three research thrusts are currently pursued. Videopsy (video autopsy) is concerned with the analysis of video data to segment and track moving objects, recognize human actions, detect abnormal events, or condense video into short summaries. The second thrust is concerned with the classification and visualization of biomedical imagery, such as that resulting from colonoscopy exams or image-guided catheter ablation of atrial fibrillation. The third thrust focuses on stereoscopic and multiscopic (3D) imagery and its use in communication, entertainment, and biomedical visualization. Some of the problems studied are: correspondence estimation under occlusions, data rendering for glasses-free 3D displays, and automatic 2D-to-3D image conversion. The laboratory is equipped with a network of manycore CPUs and GPUs, and various 3D displays.

VLSI and Neural Net Systems (VNNS)

Hubbard

The VNNS group designs, builds, and tests innovative architec-

tures that span a wide variety of VLSI applications in electrical and biological fields. Chips designed using digital, analog, and subthreshold methodologies are realized using CMOS, BiCMOS, and Bipolar technologies. Applications include biomimetic sound source localization; neural-net image processing; integrated photonic devices and parallel photonic testing; automatic partial-valued dynamic logic synthesis; single-chip large-molecule and DNA analyzers; and neural tissue interface chips as well as high-voltage Mems-mirror drivers. The group is equipped with a full suite of design tools and testing instrumentation for analog and digital systems.

Wide Bandgap Semiconductor Laboratory

Moustakas

The Wide Bandgap Semiconductor Laboratory is a state-of-the-art facility dedicated to studying the growth, fundamental material properties, and fabrication of novel electronic and opto-electronic devices. The lab specializes in III-nitride growth by Molecular Beam Epitaxy (MBE) and Hydride Vapor Phase Epitaxy (HVPE). It has a history in the development of LEDs and currently continues to focus on LEDs and semiconductor lasers in the blue-UV region of the electromagnetic spectrum. Current research highlights include visible and UV LEDs; UV semiconductor lasers; HVPE GaN templates; nitrogen cluster source; and A-plane growth of GaN.

Affiliated Research Centers

Bernard M. Gordon Center for Subsurface Sensing and Imaging Systems (CenSSIS)

<http://www.censsis.neu.edu>

The Bernard M. Gordon Center for Subsurface Sensing and Imaging Systems is a multi-university National Science Foundation Engineering Research Center (NSF-ERC) founded in 2000. Its mission is to develop new technologies to detect hidden objects and to use those technologies to meet realworld subsurface challenges in areas as diverse as noninvasive breast cancer detection and underground pollution assessment.

The center's multidisciplinary approach combines expertise in wave physics (photonics, ultrasonics, electromagnetics), multisensor fusion, image processing, and 3D CAT-scan-like reconstruction and visualization. The Gordon Center operates with the speed and agility more typical of a results-driven private company than of an academic institution, consistent with the needs of its industrial and government partners. With its commitment to leveraging technology transfer to spur economic development,

the Gordon Center is intended to be a national model for the fusion of academic research and private-sector collaboration.

The Center's academic partners are Northeastern University (NU-lead), Boston University (BU), Rensselaer Polytechnic Institute (RPI), and the University of Puerto-Rico at Mayaguez (UPRM). Strategic affiliates include Massachusetts General Hospital, Lawrence Livermore and Idaho National Laboratories, Woods Hole Oceanographic Institution, and Memorial Sloan-Kettering Cancer Center. Industrial partners include Raytheon, Analogic, Textron, Lockheed Martin, Cardiomag Imaging, Mercury, Transtech, GSSI, and Siemens; and other partners include AFOSR, NCPA (National Center for Physical Acoustics), and the National Geospatial-Intelligence Agency.

Center for Adaptive Systems (CAS)

<http://cns-web.bu.edu/about/cas.html>

The Center for Adaptive Systems (CAS) is an interdisciplinary research and training center whose interests intersect the

areas of biology, computer science, engineering, mathematics, and psychology. The Center performs interdisciplinary research aimed at discovering and developing principled theories of brain and behavior, notably concerning how individual humans and animals adapt so well on their own to rapidly changing environments that may include rare, ambiguous, and unexpected events. The Center also develops technological applications that are inspired by its biological models. Research and training are carried out both individually and through close collaborative relationships between faculty, students, and postdoctoral fellows. Research projects encompass a broad range of areas concerning cognitive and neural systems, including vision and image processing; audition, speech and language understanding; adaptive pattern recognition; cognitive information processing; self-organization and development; associative learning and long-term memory; reinforcement and motivation; attention; adaptive sensory-motor planning, control and robotics; navigation and spatial orientation; biological rhythms; consciousness; and the mathematical and computational methods needed to support advanced modeling research and applications. Both normal and abnormal behaviors are analyzed, including Parkinson's disease, attention deficit disorder, schizophrenia, and depression.

Center for Computational Science

<http://ccs.bu.edu>

The Boston University Center for Computational Science (CCS) was founded in 1990 to coordinate and promote computationally based research, to foster computational science education, and to provide for the expansion of computational resources and support.

CCS provides a forum for the multidisciplinary exchange of ideas among researchers, educators, and students. Regularly scheduled seminars as well as workshops and symposia are offered to highlight advances in computational science. CCS has acted to develop and facilitate the formulation of projects in computationally based research and education, working with scientists from 20 different departments and centers.

CCS works in close collaboration with Information Services & Technology, in particular with its Scientific Computing and Visualization Group (SCV) group, in the development of resources to support computational science. The high performance computing and visualization systems at Boston University currently include the IBM Blue Gene, an IBM pSeries 655, an IBM BladeCenter Linux Cluster, an Intel Pentium III Linux Cluster, our Deep Vision Display Wall, the Access Grid Conference Facility, the Laboratory for Virtual Environments and the Computer Graphics Laboratory. SCV provides documentation, training and support for using these facilities and accepts applications for ac-

counts online.

CCS offers a Certificate in Computational Science to graduate students in engineering and science pursuing a PhD through a multidisciplinary training program, ACES (Advanced Computation in Engineering and Science).

Center for Information and Systems Engineering (CISE)

www.bu.edu/systems

The Center for Information and Systems Engineering (CISE) provides an interdisciplinary home for research in methods and applications relevant to the design, analysis, and control of complex systems.

Information and systems engineering are disciplines with many crucial applications for our society. These application areas range from communication and sensor networks, robotics, medical imaging, and video surveillance, to modern energy systems and bioinformatics.

As these domains become increasingly complex, there is a critical need to understand, predict, and design for safety, efficiency, robustness, and the public good. With a proven track record of funding and industry collaboration, CISE faculty bring vast research experience to addressing these challenges.

Center for Nanoscience and Nanobiotechnology

<http://nanoscience.bu.edu>

Nanoscience and nanotechnology research and development are leading a revolution in basic materials science and engineering. New advancements with designed functionality are poised to enable a huge range of applications in everything from developing fundamental building blocks in the electronics, photonics, and materials sectors, to sensors, biomimetic and biocompatible platforms throughout the biomedical and health sector.

The strength of Boston University's efforts in interdisciplinary nanoscience and nanotechnology form an axis that begins in basic materials science, surface science, physics, chemistry, and engineering, extending into molecular and cellular biology, biophysics, and the technologies of microfluidics, MEMS, and onto manufacturing. The center's strengths are in developing and using nanotechnology advances in materials and platforms with our capabilities in biomedical engineering to focus on applications in understanding subcellular processes, biomolecular function and human physiology.

The Center for Nanoscience and Nanobiotechnology was established to advance academic and technological research and development in nanoscience and nanobiotechnology. The Center serves as a hub for nanoscience researchers from the

Charles River and Medical Campuses and builds activities that develop interdisciplinary research and training. The Center will connect scientists from disparate disciplines with each other in seminars, meetings, joint visitor programs and seeded projects to enhance the development of interdisciplinary nanoscale research. The Center will lead large, interdisciplinary proposal development and run funded programs for both research and training, as well as support individual researchers in their efforts by linking them with resources throughout the University and beyond. The Center will also build linkages between the research and technological commercialization resources at BU including the Photonics Center, the Technology Commercialization Institute, and Fraunhofer, and with external partners and industrial affiliates.

Center for Space Physics

www.bu.edu/csp

The Center for Space Physics (CSP) is a university-based center for research and education in space science and space-related technologies. The CSP constitutes a collaboration between science and engineering faculty at Boston University under a common mission: to advance our understanding of the atmospheres, magnetospheres, and plasma environments of our solar system. This region of space holds special interest because of its relative accessibility through space-based and ground-based sensing techniques, supported by theoretical and numerical modeling, and a variety of advanced data analysis strategies. The insights gained through these efforts help us understand how habitable environments evolve in the cosmos, in addition to having practical relevance in a society that is increasingly reliant on space-based assets.

The Center pursues a broad range of research in space physics, including: space plasma physics, magnetospheric physics, ionospheric physics, atmospheric physics, exoplanet studies, and planetary and cometary atmospheric studies. Students in astronomy, applied physics, and engineering conduct research through the Center. The Center also serves as the coordinating mechanism for grant management and proposal development through NASA, NSF, and the Department of Defense.

Hearing Research Center

www.bu.edu/hrc

The Boston University Hearing Research Center (HRC) includes 20 faculty members from six departments in four Boston University schools and colleges. The HRC was formed in 1995 for the development and dissemination of knowledge that will improve the nation's auditory health and allow the fullest utilization of the sense of hearing.

The specific goals of the HRC are to encourage, develop, and support the highest quality of basic and applied research in hearing science; exceptional education for graduate students in hearing science; and collaborative research and teaching activities among faculty and staff within the hearing science community at Boston University.

NeuroMuscular Research Center (NMRC)

www.bu.edu/nmrc

The NeuroMuscular Research Center (NMRC) was established in October 1984. Its mission is to increase our understanding of human motor control and improve the quality of life for the neuromuscularly impaired. It pursues these goals by performing basic and applied research and by developing new techniques and technology in electromyography and biomechanics. The NMRC has active collaborations with various hospitals and clinics in the Boston area as well as research groups in seven countries throughout the world.

The NMRC is organized into four laboratories. Each laboratory is supervised by a faculty member with a scientific staff of research faculty, research assistants, and graduate students, drawn from engineering, medicine, psychology and allied health. The NMRC attracts scientists and researchers from universities throughout the world and has a staff of over 20 professionals and students.

Photonics Center

www.bu.edu/photonics

Over the past decade, the Boston University Photonics Center has become well known for building a strong academic program in the field of photonics: the science and engineering of light. Today, the Center serves as a unique national resource for the development of advanced photonic device prototypes for commercial and military applications.

From its inception, the Center has attracted scholarly pioneers to lead its academic and educational programs. Ground-breaking research conducted at the Center includes work on science and technology for solid state source and detector materials; quantum cryptography; subsurface imaging; adaptive optics; micro-opto-electro-mechanical systems (MOEMS); high-speed modulation and sensing; bioorganic chemistry; nanophotonic devices; and biomedical applications of photonics.

Boston University's leadership in the field is supported by a state-of-the-art facility that includes an optical fiber draw tower and more than a dozen special-purpose research laboratories. Our shared facilities include the Optoelectronics Processing Facility, the Precision Measurement Laboratory, and the Integrated

Optics Laboratory. These assets, combined with leading academic experts and a dedicated technical and administrative staff make the Boston University Photonics Center an extraordinary resource for students, faculty, and affiliated companies.

Smart Lighting Center

<http://smartlighting.bu.edu>

The Smart Lighting Center at Boston University (SLC/BU) is part of the National Science Foundation's Smart Lighting Engineering Research Center (ERC), established in September 2008 by Rensselaer Polytechnic Institute, the University of New Mexico, and Boston University.

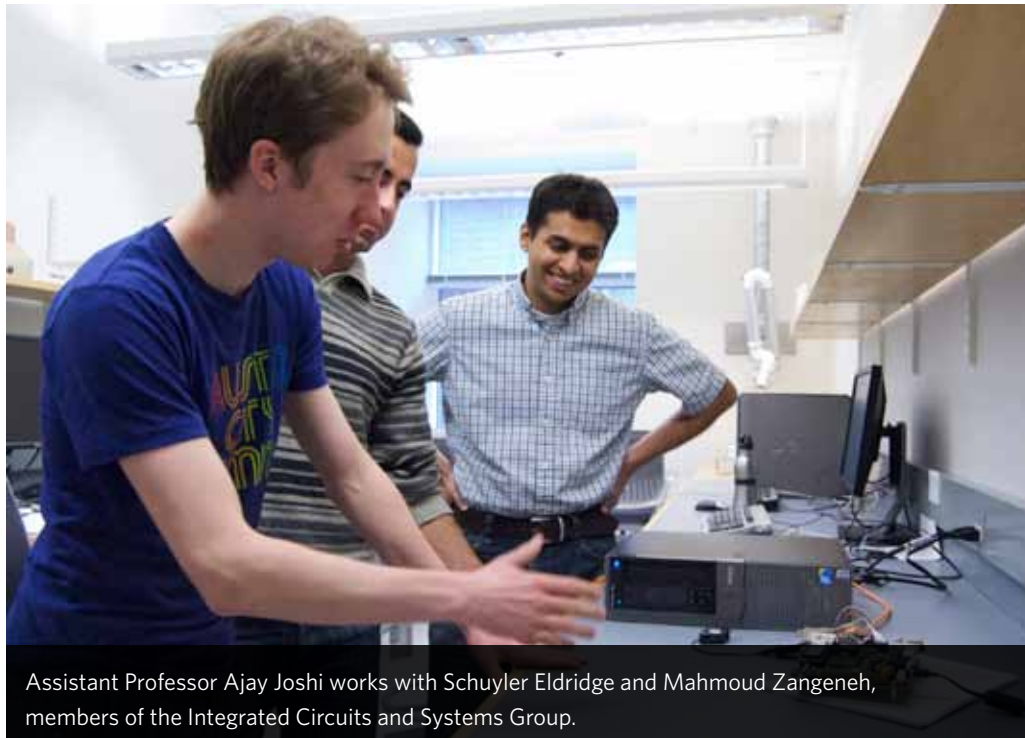
The NSF Smart Lighting ERC focuses on the creation and application of a new generation of smart light sources, whose properties are fully controllable and tunable in terms of their spectral composition, color, temperature, polarization, and spatial and modulation properties. These solid-state light sources, adaptable to myriad requirements and environments, will result in tremendous benefits to society and humankind, including:

- » Reduced pollution and global warming through increased energy conservation

- » Novel modes of communication, networking, and sensing for enhanced privacy, security and pervasive connectivity
- » Increased automobile safety via localized directional communication that can provide active braking and collision avoidance
- » Fundamental advances in biotechnology including the rapid highly specific identification of cells
- » Displays with high efficiency and large color gamut enabled by polarized emitters
- » Reduced dependency on sleep-inducing pharmaceuticals, reduced risk of cancer, and better support of the natural circadian rhythm, thereby enabling higher productivity and a better quality of life

These benefits are enabled through the systematic exploration and development of smart-lighting principles in three vertically integrated research thrusts: (i) novel materials, (ii) device technology, and (iii) system applications and impacts.

In addition to these research thrusts, other key components of the Center include an Industrial Advisory Board to drive industry requirements and technology commercialization and a network of educational outreach partners who are helping develop a new globally competitive science and technology workforce.



Assistant Professor Ajay Joshi works with Schuyler Eldridge and Mahmoud Zangeneh, members of the Integrated Circuits and Systems Group.



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