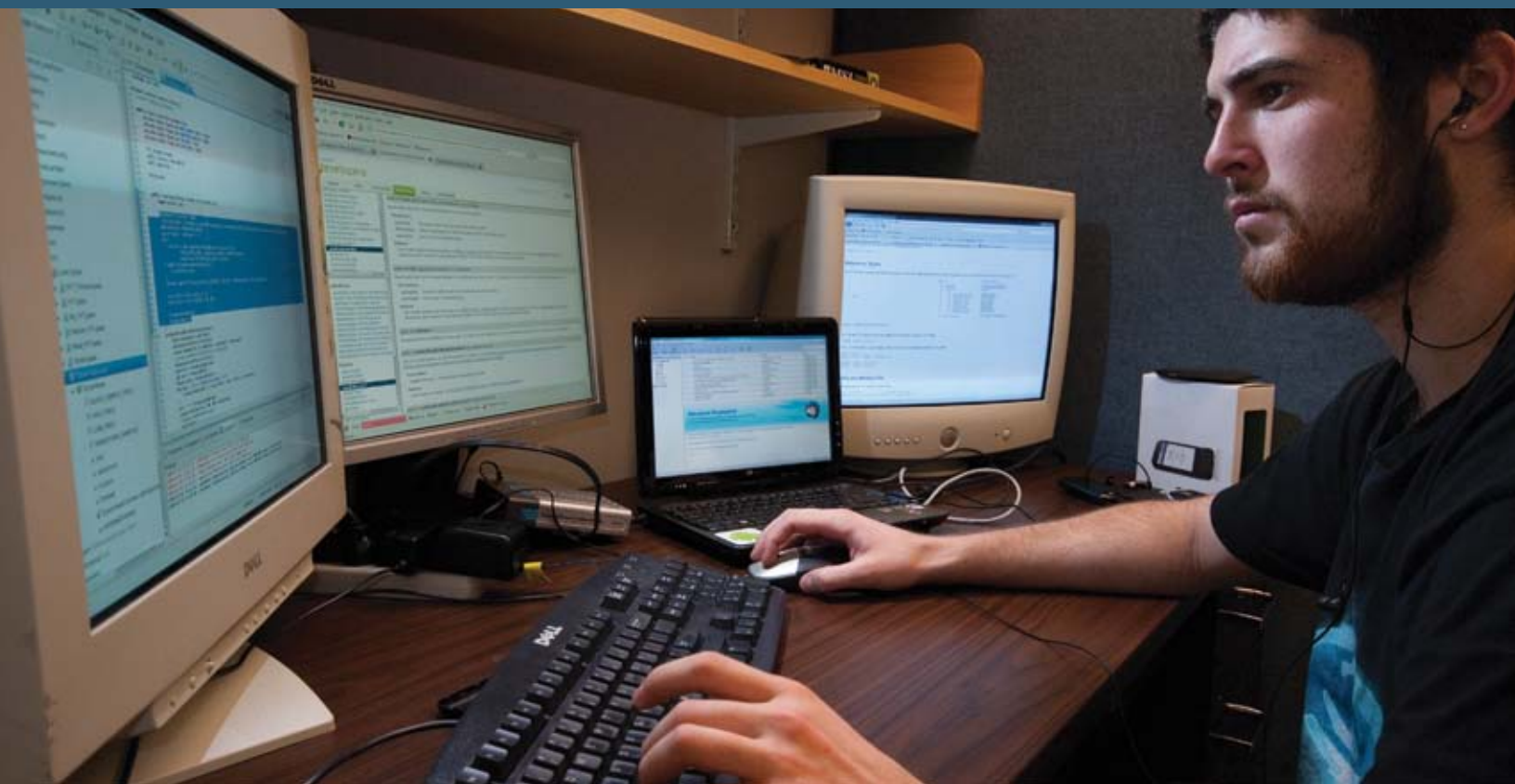


Boston University College of Engineering
Department of Electrical & Computer Engineering

Annual Report 2008-2009



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 Department of Electrical & Computer Engineering

Boston University
Department of Electrical & Computer Engineering

Annual Report 2008-2009

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Content: Gordon Ryan, ECE staff, and ECE faculty

Cover: ECE graduate student Cassandra Browning (top) and undergraduate student Matt Schoen (bottom).

This report provides a description of the instructional and research activities of the Department of Electrical & Computer Engineering at Boston University during the 2008-2009 academic year. Instructional activities are reported from the Fall 2008 through Summer 2009 semesters while scholarly activities and budget information are reported from July 1, 2008 to June 30, 2009.

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

It is hard to believe that a year has already gone by. As I am writing, I remember how in August 2008, I was driving from Madison to Boston, a U-Haul trailer securely hitched to my car, carrying all the important items that make up one's life—computers, books, the cat. Boston University's ECE Department was a largely unknown quantity, not to speak of the College of Engineering, and the University at large. Colleagues were still just names, and I had to carry a "cheat sheet" of their photos with me at the first few faculty meetings.

Now, twelve months later, I don't strain to remember names. I have learned about their passions and achievements, and shared great news ("Franco, about that proposal!") and not-so-great news ("Franco, about that proposal..."). After teaching one of the introductory courses (EK307) and ending up relying much more than I had planned on the help of two colleagues who taught the other sections, I also have a better understanding of the importance of undergraduate education at BU.

I've learned much about the Department, faculty, staff, and students over the course of the year while also overseeing the graduation of the PhD students I had in Madison (three of them—lots of miles), and the startup of my new laboratory at BU (on Nano-DNA).

Suffice it to say, it's been a busy first year.

The 2008-09 academic year has been a challenging one, primarily because of the financial crisis, and the associated anxiety and uncertainty among students and faculty. The Department stepped up advising and counseling for the students. Staff



and faculty helped in every possible way. Austerity measures were put in place to help manage shortfalls. It is remarkable that the University has been able to maintain growth, with an expanding budget, while most other universities had to undergo painful cuts and downsizing. Much of the credit goes to the steady hand of BU's administration, and to the faculty who have been able to shoulder the downturn.

I count as a major achievement our recent addition of three new members to the faculty: Ayse Coskun and Ajay Joshi as assistant professors in computer engineering and Siddharth Ramachandran as an associate professor with tenure in electrophysics, specifically in photonics. The Search Committee did an exceptional job, and its members should be commended.

I continue to work hard to increase diversity and retention

of our junior faculty. To this end, I have set up a mentoring program to help our junior colleagues navigate the waters of academic life.

In addition to the new hires, early in the year, we welcomed Professors Christos Cassandras (Head of the Division of Systems Engineering) and Ioannis Paschalidis (co-Director of the Center for Information and Systems Engineering) to the Department, as part of the College reorganization. We have successfully completed the integration process, moving their laboratories and students to our home in the Photonics Center building. I have no doubts that the new Systems Division will play an important role in the growth of our department. Along a parallel path, the Materials Science Division is establishing itself, and co-Director Professor Theodore Moustakas did a superb job of arranging an outstanding seminar series.

The divisions are an essential ingredient in the development of the departments and College toward becoming more interdisciplinary and open entities. I firmly believe that having rigid divisions (i.e., vertical research areas and disciplines) is obsolete, and that the future belongs to networks of specialties that range from energy and power on one extreme, to synthetic and systems biology on the other. We need to move forward in becoming a more open and outreaching department, welcoming new views and approaches in interdisciplinary fields. This will be reflected more and more in the new additions to the Department's faculty.

The Department continues to be very productive as a whole, with an aggregate of 103 papers, 155 conference presentations, \$10.3 million in new and ongoing grants, and 19 PhD graduates in 2008-09. The more junior tier of the Department is performing very well in terms of funding, publications, and student support—this bodes well for the future.

There is concern about current undergraduate enrollment. After decreasing for several years, the numbers have not rebounded yet. While this is a nationwide trend, it is important that we understand its causes, and move to reverse it. This will be one of my major focus areas for the coming year. In September 2009, we will have a group of distinguished colleagues from peer universities visit ECE to review the activities in our department and provide feedback. This kind of independent input is essential to help foster the Department's development. In November 2009, ABET will review the Department's programs in EE and CE to renew our certification. As you can imagine, this is consuming a significant amount of time, especially for the Associate Chair of Undergraduate Studies, Prof. Jeff Carruthers.

For a growing and forward-looking department like ECE at BU, it is absolutely essential to have the infrastructure to support expansion; we could not have moved forward without the dedicated help of our excellent departmental staff.

In summary, the outlook for the Department's growth is bright, and I look forward to an even better report next year.



Franco Cerrina
Department Chair
September 2009

Highlights

ECE Welcomes New Faculty Members

The Department of Electrical & Computer Engineering (ECE) welcomed two new professors to its ranks this year. Following the merger of the Aeromechanical (AME) and Manufacturing (MFG) Engineering departments, Professor **CHRISTOS CASSANDRAS** and Associate Professor **IOANNIS PASCHALIDIS** (both formerly of MFG), joined ECE as its newest faculty members.



Prof. Cassandras (PhD Harvard University, 1982) is the Head of the Division of Systems Engineering and co-founder of the University's Center for Information and Systems Engineering (CISE). Prior to joining Boston University in 1996, he was a member of the Electrical and Computer Engineering faculty at the University of Massachusetts, Amherst for twelve years.

He specializes in discrete event and hybrid systems, stochastic optimization, and computer simulation, with applications to computer and sensor networks, manufacturing systems, and transportation systems. Cassandras has published more than 250 refereed papers and four books. He is currently Editor-in-Chief of *IEEE Transactions on Automatic Control* and serves on several Editorial Boards. He has been a plenary speaker at various international conferences and is the recipient of several awards,

including the Distinguished Member Award of the IEEE Control Systems Society (2006), the 1999 Harold Chestnut Prize, and a 1991 Lilly Fellowship. He is a Fellow of both the IEEE and IFAC.



Prof. Paschalidis (PhD Massachusetts Institute of Technology, 1996) is Co-Director of CISE and Academic Director of the Sensor Network Consortium (SNC). He has been a member of the BU faculty since 1996 and has held visiting appointments with MIT and the

Columbia University Business School. His research interests include systems and control, networking, applied probability, optimization, operations research, computational biology, and bioinformatics, with applications to communication and sensor networks, protein docking, manufacturing systems, and supply chains.

His work on communication networks was recognized with a CAREER award from the National Science Foundation and the second prize in the 1997 George E. Nicholson paper competition by INFORMS. He is a senior member of the IEEE and an associate editor of *IEEE Transactions on Automatic Control* and *Operations Research Letters*.

Faculty Awards and Honors

HATICE ALTUG received a Massachusetts Life Sciences Center New Investigator Award.

CHRISTOS CASSANDRAS was named as a Fellow of the International Federation of Automatic Control (IFAC). He was also a keynote speaker at two conferences: the 2009 LIDS Student Conference and the 2008 UK Automatic Control Conference.

DAVID CASTAÑÓN was elected to President of the IEEE Control Systems Society and named as a member of the IEEE Society Review Committee.

FRANCO CERRINA was elevated to the rank of Fellow by

both the SPIE and American Association for the Advancement of Science (AAAS).

MARK HORENSTEIN served as the General Chair of the 2009 Electrostatics Joint Conference.

PRAKASH ISHWAR and **JANUSZ KONRAD** were members of the VCon Technologies team, which won First Prize in the Boston University College of Engineering Entrepreneur Design Contest. Their proposal aims to provide state-of-the-art algorithms that help close the gap between the massive amounts of surveillance information that is amassed by modern security systems and the

comparatively small amount that is ultimately analyzed.

PRAKASH ISHWAR was elected to serve a six-year term on the IEEE Image, Video, and Multidimensional Signal Processing Technical Committee.

W. CLEM KARL was named as Vice-Chair for IEEE Biomedical Image and Signal Processing Technical Committee.

THOMAS LITTLE was a member of the Route Optimization System team that was awarded Second Prize in the Boston University College of Engineering Entrepreneur Design Contest. The goal of this system is to develop innovative hardware and software technology that significantly reduces the amount of time vehicles are stuck in traffic by cutting-down the delay in real-time traffic updates and delivering intelligence to customers.

THOMAS LITTLE also received the 2008-2009 College of Engineering Faculty Service Award.

MALAY MAZUMDER earned the Lifetime Achievement award from the Electrostatic Society of America.

THEODORE MOUSTAKAS and **ROBERTO PAIELLA** were named as Boston University College of Engineering Dean's Catalyst Award recipients for their proposal to develop an intermediate-band solar cell that increases efficiency of such cells by more than 30 percent. Using indium gallium nitride, the researchers will attempt to maximize absorption of electrons below allowable limits, or below-bandgap, within a confined space. They also plan to use patterned silver nano-particles located on the device's surface to demonstrate that the direct light can lead to a greatly enhanced absorption path.

JOSHUA SEMETER received the 2008-2009 ECE Award for Excellence in Teaching.

DAVID STAROBINSKI was awarded an Ecole Polytechnique Federale de Lausanne Visiting Professor Fellowship.

MALVIN TEICH was named as an Optical Society of America (OSA) Traveling Lecturer and an IEEE Engineering in Medicine and Biology Society (EMBS) Distinguished Lecturer.

SELIM ÜNLÜ was awarded the TÜBİTAK Special Award for his significant contributions to the advancement of universal science. The Special Award is reserved for Turkish scientists living abroad and, along with the TÜBİTAK Science Award, is Turkey's highest award given for scientific achievement.

Promotions and Tenure

Two faculty members, **MURAT ALANYALI** and **JOSHUA SEMETER**, were promoted to the rank of Associate Professor with tenure this year.

Additionally, **JANUSZ KONRAD** was promoted to the rank of Full Professor.

Undergraduate Program

This year, the Department participated in the completion of a suite of College-wide minors. Minors are now offered in Biomedical, Systems, Materials, Mechanical, Electrical, and Computer engineering. In addition, two concentrations were created: one in Environmental Engineering and Energy, and the other in Nanotechnology.

Combined enrollment in the BS programs was 201 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 twenty-nine and thirty-two, 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 Teaching Excellence Award continued this year.

Undergraduate Student Awards

Students **KEVIN ALLGAIER**, **BRIANNA CARGES**, **AMY COSTANDI**, **BARRY LAI**, and **JEFF LI** of team Phoney Money (iPhone Credit Card System) were selected by Senior Project faculty as recipients of the 2009 P.T. Hsu Memorial Award for the best overall ECE senior design project.

This year, three senior design teams were honored for their efforts on ECE Day with Best Presentation awards (*see page 23*):

- » **The 5 Moniteers**: Christopher Arensdorf, Matthew Carey, Shawn Fitzpatrick, Michael Tirgardon, and Andrew Velasco
- » **Macrosoft**: Abin Ajayakumar, Moses Chen, Nael Musleh, Christopher Ogorzalek, and Patrick Raspante
- » **Phoney Money**: Kevin Allgaier, Brianna Carges, Amy Costandi, Barry Lai and Jeff Li

Graduate Program

Three new PhD students were awarded Dean's Fellowships (DFs) and matriculated in Fall 2008. All three of these students will be continuing their degree programs and are making excellent progress. Sixteen new graduate students matriculated with Graduate Teaching Fellowships (GTFs) in the same period; seven of these students were offered Research Assistantships (RAs) for the Summer or Fall 2009 semesters. We also recruited one new DF and thirteen new GTFs for the Fall 2009 semester.

The BU Photonics Center continued the Photonics Fellowship program, funding photonics graduate students in the sciences and engineering. ECE PhD student Ronen Adato was a recipient of the Senior Student Award. Fall 2009 matriculate Arif Cetin was also awarded the Photonics Fellowship for the 2008-2009 academic year.

Graduate Student Awards

ECE graduate students made an excellent showing in the 2009 Science and Engineering Day hosted by the University. **ERHAN ERMIS** received the Center for Information and Systems Engineering Award for his poster entitled “Multicamera Fusion for Uncalibrated Cameras” (Advisor: Prof. **VENKATESH SALIGRAMA**). Mr. Ermis was also the recipient of the ECE Award for the same poster at this event.

New in the 2008-2009 academic year was the creation of a college-wide best dissertation award. The College of Engineering Best Dissertation award was created to annually recognize the most outstanding PhD research by a student completing during the twelve-month period prior to May. The inaugural award was given to **SHUCHIN AERON** for his dissertation entitled, “Efficient Sensing and Reconstruction of Sparse Phenomena: Bounds and Algorithms.” Aeron’s research was conducted under the guidance of advisor Prof. **VENKATESH SALIGRAMA** and is in the Information Systems and Sciences research area.

Two ECE student/faculty teams won top honors in the Boston University College of Engineering Second Annual Entrepreneur Design Contest (EDC), which was held in the spring of 2009 and culminated in a final round and award ceremony held on April 23, 2009. First prize (\$2,000) was awarded for VCon, a business concept for video monitoring by **AJAY BANGLA, STEPHEN CHAO**, Prof. **PRAKASH ISHWAR**, and Prof. **JANUSZ KONRAD**. Second prize (\$1,000) went to Smart Travel, Inc. a company focused on route optimization and traffic congestion monitoring by **ASHISH AGARWAL, MATT WOOL, LONN DRUCKER**, Prof. **THOMAS LITTLE**, and Prof. **IAIN COCKBURN**.

Major Grants

New research funding this year totaled approximately \$10.3M in awards for research, of which \$6.7M were awarded to ECE Principal Investigators (PI) and \$3.6M were awarded to ECE faculty members working as Co-PI on projects outside of the Department. Of the PI awards, twenty-one were for new research projects, while thirty-four awards were for continuing projects.

This year, **ENRICO BELLOTTI** received \$311k in new funding for a National Science Foundation (NSF) award for “Theoretical

Investigation of Optoelectronic Devices Based on the ZnO Material System.” **ROBERTO PAIELLA, THEODORE MOUSTAKAS**, and Bellotti also received new funding from the NSF in the amount of \$400k for their project “GaN-Based Quantum-Structure Devices for THz Light Emission and Photodetection.”

THOMAS LITTLE, JEFFREY CARRUTHERS, and **HATICE ALTUG** received \$625k in new funds from the NSF for the launch of the Smart Lighting Center at Boston University, a joint Engineering Research Center with Rensselaer Polytechnic Institute (RPI) and the University of New Mexico that focuses on the creation and application of new-generation solid-state light sources. This grant is subcontracted via RPI and in conjunction with the Center for Information and Systems Engineering (CISE).

ECE faculty received several other grants in conjunction with CISE. **DAVID CASTAÑÓN, CLEM KARL**, and **VENKATESH SALIGRAMA** received \$275k in new funding from the Department of Homeland Security through a subcontract with Northeastern University relative to awareness and location of explosives-related threats. **PRAKASH ISHWAR** received \$250k for his research “Towards a Paradigm-Shift in Distributed Information Processing - Harnessing Group Structure and Interaction.” Castañón and **CHRISTOS CASSANDRAS** received \$178k in continued funding from the Department of Defense (Air Force) for their project “Distributed Mission Control for Unmanned Air Vehicles in Stochastic Environments.” **IOANNIS PASCHALIDIS** and **Cassandras** also received \$252k of continued funding for “Distributed Wireless Sensor Networks for Long-Term Deployments.”

The NSF research center, Bernard M. Gordon Center for Subsurface Sensing and Imaging Systems (CenSSIS), a multi-university collaborative between Boston University, Northeastern University, Rensselaer Polytechnic Institute, and the University of Puerto Rico Mayagüez, continued its ninth year with Research Thrust 1 led by **MALVIN TEICH** and funded at \$84k; Research Thrust 2 led by **DAVID CASTAÑÓN** and funded at \$196k; the education program led by **MICHAEL RUANE** funded at \$40k; and a \$35k supplement led by **BAHAA SALEH** and Teich.

MARTIN HERBORDT continued his research regarding “FP-GA-Based High Performance Computing” funded by HHS/NIH/NCRR in the amount of \$279k. **THEODORE MORSE**, in conjunction with the Center for Nanoscience and Nanobiotechnology, received \$750k of continuing funding from the Department of Defense (Navy) for research on “A New Approach to High-Power, Eye-Safe, Laser Technology Applications.” Also, **MALVIN TEICH** and **BAHAA SALEH** received \$204k in continued funding from the Department of Defense (Army) for a MURI award in conjunction with the Boston University Photonics Center through a subcontract with the University of Rochester relative to “Quantum Imaging: New Methods and Applications.”

Events

ECE Day 2009

Initiated in 1997, ECE Day is a forum for seniors to present their capstone projects and graduate students to present their research posters. Held at the end of the Spring semester, ECE Day 2009 included eleven graduate research posters, eleven senior design presentations, and three thesis 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 the faculty. Symposia are held at the end of each semester. This year's events were August 8, 2008, December 12, 2008, and May 4, 2009.

Bernard M. Gordon CenSSIS NSF Site Visit

The Gordon-CenSSIS (Center for Subsurface Sensing and Imaging Systems) NSF Site Visit, held April 22-23, 2009, brought together CenSSIS researchers and students from Boston University, Northeastern University, Rensselaer Polytechnic Insti-

tute, and University of Puerto Rico Mayagüez; NSF evaluators; and Gordon-CenSSIS industry and institutional collaborators. The Year Nine site visit included a student kick-off bowling and billiards event at Jillians; faculty presentations on the Center's three research thrusts; research and sustainability plans for Gordon-CenSSIS; a student-industry luncheon; industrial and science boards' meetings; a student poster session; a presentation on education and diversity; and a closed meeting with the NSF site team for the student SWOT analysis. More than 185 people, including approximately 80 students, attended.

Electrostatics 2009

The 2009 Electrostatics Joint Conference, which included the Electrostatics Society of America, IEEE-IAS Electrostatic Processes Committee, Institute of Electrostatics Japan, La Société Française d'Electrostatique, and the International Electrostatic Assembly, was held in the Photonics Center building June 16-18, 2009. The conference, sponsored by the ECE Department and chaired by Prof. **MARK HORENSTEIN**, included three days of technical sessions and opening and closing receptions held at the Brookline Holiday Inn.



Faculty and Staff

Core Faculty



MURAT ALANYALI

Associate Professor

Communication networks; performance analysis and optimization; stochastic systems

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



MAJA BYSTROM

Associate Professor

Source and channel coding; multi-media communications; image processing

- » PhD, Rensselaer Polytechnic Institute, 1997
- » 1999 NSF CAREER Award
- » 2005 ECE Award for Excellence in Teaching
- » 2001 Fulbright Award
- » Associate Editor, *Signal Processing Letters*



HATICE ALTUG

Assistant Professor

Nano-phonic devices and sensors; photonic switches for communication and bio-sensing applications

- » PhD, Stanford University, 2006
- » 2009 New Investigator Award, Massachusetts Life Sciences Center
- » 2008 BU Peter Paul Career Development Professorship
- » 2008 BU College of Engineering Dean's Catalyst Award
- » 2006 Best Research Paper, IEEE LEOS Conference



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*



ENRICO BELLOTI

Associate Professor

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

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



JEFFREY CARRUTHERS

Associate Professor &

Associate Chair for Undergraduate Studies

Wireless infrared communications; broadband communications; mobile and wireless networks

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



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
- » 2007 Faculty Service Award
- » Associate Editor, *Journal of Biomedical Optics*
- » Associate Editor, *Lasers in the Life Sciences*
- » Invited Nominator, 2007 Nobel Prize in Physics



CHRISTOS CASSANDRAS

Professor

Analysis and control of discrete event dynamic systems; stochastic control and optimization; dynamic control of computer and communication networks

- » PhD, Harvard University, 1982
- » Fellow, IEEE and IFAC
- » Editor-in-Chief, *IEEE Transactions on Automatic Control*
- » IEEE Control Systems Society Board of Governors
- » 1991 Lilly Fellow
- » 2006 Distinguished Member Award, IEEE Control Systems Society
- » 1999 Harold Chestnut Prize
- » IEEE Distinguished Lecturer
- » Department Editor, *Journal of Discrete Event Dynamic Systems*
- » Associate Editor, *Intl. Journal of Intelligent Computing and Cybernetics and Intl. Journal of BioSciences and Technology*
- » Past Associate Editor, *Automatica* and *IEEE Transactions on Automatic Control*
- » Past Editor, Technical Notes and Correspondence, *IEEE Transactions on Automatic Control*
- » Honorary Professor, Huazhong University of Science and Technology and Wuhan University of Science and Technology



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 M.I.T., 1974-1976
- » Past Managing Editor, *International Journal of Computational Physics*

**DAVID CASTAÑÓN***Professor*

Stochastic control; estimation optimization; image understanding and parallel computation

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

**FRANCO CERRINA***Professor and Chair*

Semiconductor devices and fabrication modeling, nanolithography, nanofabrication, optics, optical systems, X-rays, synchrotrons, DNA synthesis, system and synthetic biology

- » PhD, University of Rome, 1974
- » Fellow: IEEE, Optical Society of America, American Physical Society, American Association for the Advancement of Science, SPIE

**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
- » Dean's Catalyst Award, 2007

**AZZA FAHIM***Assistant Professor*

Electric machines; computations in electromagnetics

- » PhD, Cairo University, 1984

**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
- » 1996 ENG Award for Excellence in Teaching

**MARTIN HERBORDT***Associate Professor*

Computer architecture; electronic design automation; configurable computing; bioinformatics

- » PhD, University of Massachusetts, 1994
- » 2008 IBM Faculty Award
- » 1997 NSF CAREER Award

**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
- » 2002 College of Engineering Award for Excellence in Teaching

**PRAKASH ISHWAR***Assistant Professor*

Signal, image, and video processing (statistical, multiresolution, distributed); information theory and communications (network coding, computation, security)

- » PhD, University of Illinois Urbana-Champaign, 2002
- » 2005 NSF CAREER Award
- » 2007 Dean's Catalyst Award

**W. CLEM KARL***Professor*

Multidimensional and multiscale signal and image processing and estimation, particularly applied to geometrically and medically oriented problems

- » PhD, Massachusetts Institute of Technology, 1991
- » 2000 ECE Award for Excellence in Teaching
- » Past Associate Editor, *Tomography & MRI, IEEE Transactions on Image Processing*; Past Assistant Editor, *Systems Control Newsletter*

**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
- » 1989 IBM Outstanding Innovation Award; 1988 IBM Division Award; 1983 IBM Outstanding Technical Achievement Award
- » Past Editor, *Solid State Electronics*



JANUSZ KONRAD

Professor

Multimedia communications; image and video processing; stereoscopic and 3-D imaging; digital signal processing

- » PhD, McGill University, 1989
- » Fellow, IEEE
- » 2001 IEEE Signal Processing Magazine Award
- » 2004-2005 EURASIP Image Comms Best Paper
- » 2007 Dean's Catalyst Award
- » Associate Technical Editor, *IEEE Communications Magazine*; Associate Editor, *EURASIP Journal on Image and Video Processing*; Past Associate Editor, *IEEE Signal Processing Letters*; Past Associate Editor, *IEEE Transactions on Image Processing*



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
- » 2007 Dean's Catalyst Award



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
- » 2008 BU ECE Award for Excellence in Teaching
- » 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 Graduate Studies

Mobile Ad Hoc Networks (MANETs); multimedia computing; computer networking; software engineering; embedded sensor networks

- » PhD, Syracuse University, 1991
- » 1995 NSF CAREER Award
- » 2007 Dean's Catalyst Award
- » 2009 BU College of Engineering Faculty Service Award
- » 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 of Nitride Semiconductors; Optical devices (LEDs, LDs, Optical modulators, Detectors) from deep UV to THz

- » 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
- » 1998 ECE Award for Excellence in Teaching
- » 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*.



S. HAMID NAWAB

Professor

Cognition and brain signal processing; short-time and short-space signal processing; artificial intelligence in signal processing

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



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

Optical technologies for information processing; photonic devices based on semiconductor quantum structures, including group-III nitride quantum wells; nanoscale photonic devices and circuits; ultrafast optics

- » PhD, California Institute of Technology, 1998
- » Senior Member, IEEE
- » 2008 BU Office of Technology Development Ignition Award
- » 2009 BU College of Engineering Dean's Catalyst Award

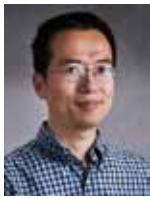


IOANNIS PASCHALIDIS

Associate Professor

Design, performance analysis, and control of communication and sensor networks, supply chains, and distribution systems; computational biology; Queueing theory and stochastic systems; Optimization and decision theory

- » PhD, Massachusetts Institute of Technology, 1996
- » Senior Member, IEEE
- » National Science Foundation CAREER Award, 2000
- » Second Prize, 1997 George E. Nicholson paper comp
- » Associate Editor, *IEEE Trans. Automatic Control*
- » Associate Editor, *Operations Research Letters*
- » Elected Full Member of Sigma Xi, 1996

**WEI QIN***Assistant Professor*

Tools, methods and architectures for embedded systems; synthesis and verification of programmable processors; design languages for electronic systems

- » PhD, Princeton University, 2004
- » 2006 ECE Award for Excellence in Teaching

**THOMAS SKINNER***Associate Professor*

Microprocessors; computer networks; operating systems; distributed systems

- » PhD, Boston University, 1982
- » 2003 Microsoft Most Valuable Professional Award
- » 1997 College of Engineering Award for Excellence in Teaching

**MICHAEL RUANE***Professor*

Resonant cavity imaging system; micro-magnetics modeling; optical systems; AFRL Loss Cone Imager DSX Satellite

- » PhD, Massachusetts Institute of Technology, 1980
- » Senior Member, IEEE
- » 2004 ASEE Outstanding Teacher Award
- » 1999 ECE Award for Excellence in Teaching
- » 1991 College of Engineering Faculty Service Award

**DAVID STAROBINSKI***Associate Professor*

Wireless and sensor networks; QOS and traffic engineering; networks performance evaluation

- » PhD, Technion, Israel Institute of Technology, 1999
- » 2009 EPFL Visiting Professor Fellowship
- » 2004 Department of Energy Early Career Award
- » 2002 NSF CAREER Award

**BAHAA E.A. SALEH***Professor*

Quantum optics; nonlinear optics; image processing

- » PhD, Johns Hopkins University, 1971
- » Fellow: IEEE, OSA, Guggenheim Foundation
- » 2008 OSA Distinguished Service Award
- » 2006 Kuwait Prize, 2004 BACUS Award, 1999 OSA Beller Award
- » Deputy Director, CenSSIS
- » Past Editor-in-Chief, *Journal of the Optical Society of America: Optics, Image Science and Vision*

**ANNA SWAN***Associate Professor*

Development of nanoscale optical self-interference microscopy; optical properties of carbon nanotubes

- » PhD, Boston University, 1993
- » Senior Member, IEEE

**VENKATESH SALIGRAMA***Associate Professor*

Information and control theory; statistical signal processing; applications to sensor networks

- » PhD, Massachusetts Institute of Technology, 1997
- » 2005 NSF CAREER Award
- » 2003 ONR Presidential Early Career Award
- » 2002 ONR Young Investigator Award

**ALEXANDER TAUBIN***Associate Professor*

Asynchronous circuit, logic design; computer architecture; CAD; attack resistant hardware

- » PhD, Electrotechnical University of St. Petersburg, 1981
- » Senior Member, IEEE

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

**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
- » 1997 IEEE Morris E. Leeds Award, 1992 Palacky University Memorial Gold Medal, 1969 IEEE Browder J. Thompson Memorial Prize
- » IEEE EMBS Distinguished Lecturer
- » OSA Traveling Lecturer
- » Editorial Advisor, Photonics and Physical Electronics, *Physics Today*

**ALEXANDER SERGIENKO***Professor*

Correlation spectroscopy, field optical microscopy and spectroscopy of semiconductor materials and devices; quantum communications; remote laser sensing; laser physics; nonlinear optics; quantum optics, including quantum radiometry and metrology

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



ARI TRACHTENBERG

Associate Professor

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

- » PhD, University of Illinois, Urbana-Champaign, 2000
- » 2002 NSF CAREER Award
- » 2003 ECE Award for Excellence in Teaching
- » Senior Member, IEEE



SELIM ÜNLÜ

Professor and Associate Dean for Research and Graduate Programs

Photodetectors; nano-optics: high-resolution and solid immersion lens microscopy, subsurface imaging of semiconductor devices and circuits, biophotonics: biosensor fabrication and biological imaging techniques

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

Research Faculty



MALAY MAZUMDER

Research Professor

Particle technology, material engineering, electrostatic engineering



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

Affiliated Faculty



JOHN BAILLEUL

Professor, Mechanical Engineering

Robotics; control of mechanical systems; mathematical system theory



SOLOMON EISENBERG

Professor and Chair, Biomedical Engineering

Electrically mediated phenomena in tissues and biopolymers



SUPRIYA CHAKRABARTI

Professor, Astronomy

Space experimentation; ultraviolet spectroscopy



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



CARLO DE LUCA

Professor, Biomedical Engineering

Motor control of normal and abnormal muscles, objective evaluation of muscle fatigue in humans, objective assessment of functional activities in humans, advanced technology for detecting and applying biosignals



THEODORE FRITZ

Professor, Astronomy

Space plasma and magnetospheric physics; magneto sphere-ionosphere coupling; substorms; charged particles and compositions; rocket and satellite experiments

**BENNETT GOLDBERG***Professor, Physics*

Room- and low-temperature, near-field microscopy of semiconductors and biological systems; magneto-optics and magneto-transport of two- and one-dimensional electron fields

**JEROME MERTZ***Professor, Biomedical Engineering*

Development and applications of novel optical microscopy techniques for biological imaging

**WILLIAM KLEIN***Professor, Physics*

Kinetics of phase transitions, the physics of earthquakes and the study of damage in materials

**ERIC SCHWARTZ***Professor, Cognitive & Neural Systems*

Computational neural science; machine vision; neural anatomy; neural modeling

**MICHAEL MENDILLO***Professor, Astronomy*

Low-light level optical instrumentation; signal processing in space physics; planetary atmospheres; GPS satellite communications; space plasmas in the solar system

**WILLIAM SKOCPOL***Professor and Faculty Director, Physics*

Emeritus Faculty

**JOHN BRACKETT***Professor Emeritus*

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

» PhD, Purdue University, 1963

**DAVID PERREAULT***Professor Emeritus*

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

» PhD, Purdue University, 1968

**THOMAS KINCAID***Professor Emeritus*

Signal and image processing; neurodynamics; non-destructive testing

» PhD, Massachusetts Institute of Technology, 1965

**RICHARD VIDALE***Professor Emeritus*

Modeling and simulation, software engineering

» PhD, University of Wisconsin-Madison, 1964

Adjunct Faculty

EDWARD BACH*EC440 (Spring 2009)*

» PhD, Boston University, 2007

JOHN BRACKETT*EC700 (Fall 2008) & EC518 (Spring 2009)*

» PhD, Purdue University, 1963

VLADIMIR KLEPSTYN*EC518 (Fall 2008) & EC410 (Summer 2009)*

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

BABAK KIA MONTAZAM*EC464 (Spring 2009) & EC757 (Summer 2009)*

» MS, Boston University, 1996

ALAN PISANO*SC463 (Fall 2008) & SC402 (Spring 2009)*

» PhD, Northeastern University, 1974

MAKHOLOUF REDJDAL*EK307 (Summer 2009)*

» PhD, Boston University, 1997

Tatyana Roziner



Associate Professor **TATYANA ROZINER**, a dedicated teacher who called thousands of students her “kids,” passed away March 12, 2009, at the age of seventy-two.

Roziner was a member of the Department of Electrical & Computer Engineering for twenty-two years when she retired in February 2008. She worked on research in computer engineering and communications, but is best remembered by the Boston University community for her great dedication to teaching and care for each student she taught. Roziner’s teaching schedule typically included three large undergraduate classes per semester, but despite the great numbers of students, her classes never became routine and she gave all of her students an exceptional degree of personal attention.

Roziner earned her doctorate degree at the USSR Academy of Sciences and worked in the military and industry in the Soviet Union. In 1978, she moved to Israel where she worked in the aircraft industry. In 1985, she emigrated to the United States, settling in Newton, Massachusetts. She began teaching at ECE in January 1986 and instructed thousands of undergraduates, guiding them through foundational principles in engineering, from circuit theory to communication systems.

Departures

After 14.5 years as an ECE Professor—thirteen of which were spent as Department Chair—**BAHAA SALEH** relocated to Orlando to become Dean of the College of Optics and Photonics at the University of Central Florida (UCF). Under his guidance as Chair, the ECE Department grew significantly, adding twelve faculty positions, tripling its research funding, emerging as a top fifty program in both electrical and computer engineering disciplines, and becoming one of the world’s finest research institutions for photonics and information sciences and systems.

Assistant Professor **AZZA FAHIM**, one of the Department’s outstanding teachers, was also with ECE for 14.5 years and relocated to Orlando. She is now a lecturer in the Department of Electrical Engineering & Computer Science at UCF.

Staff

Administrative Staff

WAYNE RENNIE

Director

JAMES GOEBEL

Manager, Technology and Systems

CARLY MARCHIONI

Assistant Director

ELBERT JORDAN

Financial Administrator

JULIE GUTHRIE

Academic Programs Manager

DAVID DELAKAS

Grants Administrator

KAREN GALVEZ

Senior Programs Coordinator

GORDON RYAN

Publications, New Media, and Promotions Administrator

BECKY BELL

Assistant to the Chair

Technical Staff

JIM BARDIN

Systems Analyst/Administrator I

DAN BERKOVITCH

Systems Analyst/Administrator I

ALEXEY NIKIFOROV

MBE Laboratory Manager

VLADIMIR KLEPSTYN

Electronic/Circuits Laboratory Manager

HOWARD COHEN

VNNS Laboratory Manager

Research Staff

NAME	TITLE	ADVISOR
Atia, George	Research Associate	Castañón
Benezeth, Yannick	Research Assistant	Saligrama
Bergstein, David Alan	Research Associate	Ünlü
Bertazzi, Francesco	Research Assistant	Bellotti
Bhattacharyya, Anirban	Research Associate	Moustakas
Bonato, Cristian	Research Assistant	Sergienko
Boriskina, Svetlana	Research Associate	Dal Negro
Boura, Jihad	Visiting Scholar	Hubbard
Cetin, Mujdat	Visiting Scholar	Karl
Chanley, Paul	Visiting scholar	Ruane
Chivas, Robert	Research Associate	Morse
Chu, Larry	Visiting Scholar	Cerrina
Dimakis, Emmanouil	Research Associate	Moustakas
Do, Synho	Visiting scholar	Karl
Dorignac, Jerome	Research Associate	Campbell
Feng, Ning-Ning	Research Associate	Dal Negro
Forestiere, Carlo	Research Assistant	Dal Negro
Furno, Enrico	Visiting Scholar	Bellotti
Jiang, Fan	Research Associate	Cerrina
Jodoin, Pierre-Marc	Research Associate	Saligrama
Laifenfeld, Moshe	Research Associate	Trachtenberg
Li, Keyong	Research Associate	Paschalidis
Lopez, Carlos	Research Associate	Ünlü
Mao, Jianfeng	Research Associate	Cassandras
Minaeva, Olga	Research Assistant	Sergienko
Moe, Craig	Research Associate	Moustakas
Mustafa, Mehmet	Visiting Scholar	Levitin
Nasr, Magued	Research Assistant	Teich
Ozkumur, Emre	Research Associate	Ünlü
Park, Jin	Sr. Research ASC	Herbordt
Penna, Michele	Research Assistant	Bellotti
Perez, Samuel	Visiting scholar	Ruane
Roberts, Carson	Visiting Scholar	Morse
Rykalova, Yelena	Visiting Scholar	Levitin
Shubochkin, Roman	Research Associate	Morse
Thomidis, Christos	Research Assistant	Moustakas
Vacelet, Valentine	Visiting Scholar	Kotiuga
Veeravalli, Venugopal	Visiting Scholar	Ishwar

NAME	TITLE	ADVISOR
Vegni, Anna Maria	Visiting Scholar	Little
Wong, Wai Yan	Research Assistant	Teich
Yalcin, Ayca	Research Associate	Ünlü
Yanik, Ahmet Ali	Research Associate	Altug
Zettergren, Matthew	Research Associate	Semeter

Department Administration and Committees

FRANCO CERRINA	Department Chair
JEFFREY CARRUTHERS	Associate Chair for Undergraduate Studies
THOMAS LITTLE	Associate Chair for Graduate Studies
WAYNE RENNIE	Department Director

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). *Cerrina (Chair), Little (Assoc. Chair, Grad), Carruthers (Assoc. Chair, Undergrad), Herbordt (CE), Castañón (ISS), Sergienko (EP), Rennie (Director), Ünlü (ENG)*

The **Undergraduate Committee** is responsible for all aspects of the undergraduate program, including program and curricular changes; new courses; evaluation of instruction and student advising; and 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. *Carruthers (Chair), Bystrom, Castañón, Horenstein, Ishwar, Ruane, Semeter, Starobinski, Galvez, Guthrie*

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 these committees; and coordination of poster presentations on ECE Day. *Little (Chair), Oliver (Assoc. Chair), Alanyali, Altug, Dal Negro, Ishwar, Konrad, Paschalidis, Qin, Swan, Taubin, Trachtenberg*

The **Search Committee** is responsible for the recruitment of new faculty. It coordinates advertisements, interviews of candidates, and makes recommendations to the faculty for new appointments. *Cerrina (Chair), Herbordt, Hubbard, Karl, Karpovsky, Paiella, Saligrama, Trachtenberg, Rennie (ex-officio), Bell*

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. *Cerrina (Chair), Brower, Karl, Levitin, Moustakas, Sergienko, Saligrama, Rennie (ex-officio), Bell*

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 local, national and international level. It is also in charge of the ECE Colloquium, the Department Spotlight Seminar series, and other ad hoc seminars and research talks. *Ryan (Coordinator), Ishwar, Kotiuga, Paiella, Qin, Rennie, Toffoli*

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. *Cerrina (Chair), Horenstein, Hubbard, Knepfer, Marchioni, Pisano, Rennie, Ruane, Skinner, Bell*

The **Information Technology Committee** is tasked with maintaining, upgrading, and improving the information technology infrastructure of the Department. *Starobinski (Chair), Giles, Hubbard, Konrad, Semeter, Toffoli, Rennie, Goebel*

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. *Cerrina (Chair), Bigio, Brower, Giles, Karpovsky*

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 2008 ENROLLMENT				
	<i>Electrical</i>	<i>Computer Systems</i>	<i>Computer**</i>	<i>Total</i>
Freshmen*	22	16		38
Sophomores*	30	16		46
Juniors	31	25	1	56
Seniors	31	30		61
Total	114	87	1	201

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

** "Computer Systems Engineering" has been renamed "Computer Engineering." For current students, the degree name change is optional, but all new declared majors will be Computer Engineering.

Undergraduate Degrees Awarded

MAJOR	DEGREE RECIPIENTS
Computer Systems Engineering	32
Electrical Engineering	29
Total	61

Course and Program Development

This year, the College completed its reorganization into three departments and two divisions. As part of this process, the College has now created six minors and two concentrations available to ECE students. The minors available are Biomedical, Computer, Electrical, Materials, Mechanical, and Systems engineering. The concentrations are in Nanotechnology, and Environmental Engineering and Energy. In support of the Nanotechnology concentration, a new course, EC481 Fundamentals of Nanotechnology, was created by Profs. Swan and Altug.

Our senior design course continues to evolve in response to evaluation and assessment from students, alumni, and faculty. Some recent changes include increased emphasis on testing, introduction of project management tools, skill clinics, and a move from four-person teams to five-person teams.

Student surveys were conducted to collect and analyze data on student perceptions of how well our programs are achieving their outcomes.

Undergraduate Courses

COURSE NUMBER	COURSE TITLE	FALL '08	SPRING '09	SUMMER '09
EK131	Intro to Engineering	Toffoli Ruane Trachtenberg Dal Negro	Kotiuga Giles Starobinski	
EK307	Electric Circuit Theory	Fahim	Semeter Sergienko Cerrina	Redjdal
EK317	Circuit Theory I	Fahim		
EK318	Circuit Theory II		Oliver	
EK501	Math Methods I	Kotiuga		
EC 311		Qin	Karpovsky Taubin	
EC312	Computer Organization	Taubin		
EC327	Intro to Software Engineering	Trachtenberg	Brower	
EC330	Applied Algorithms		Trachtenberg	
EC381	Probability Theory in ECE	Castañón	Castañón	
EC401	Signals and Systems	Carruthers	Bystrom	Carruthers
EC402	Control Systems		Pisano	
EC410	Intro to Electronics	Sergienko Ünlü Knepper	Knepper	Kleptsyn
EC412	Analog Electronics		Sergienko	
EC413	Computer Organization		Herbordt	
EC416	Intro to Digital Signal Processing		Nawab	
EC440	Intro to Operating Systems		Bach	
EC441	Intro to Computer Networks	Starobinski		
EC447	Software Design	Skinner		
EC450	Microprocessors	Giles	Giles	
EC455	Electromagnetic Systems I	Semeter		Lee
EC456	Electromagnetic Systems II		Kotiuga	
EC463	Senior Design Project I	Ruane/Pisano		
EC464	Senior Design Project II		Ruane/Montazam	
EC471	Physics of Semiconductor Devices		Swan	
EC500	Special Topics in ECE		Moustakas	
EC501	Dynamic Systems Theory	Dupont		
EC505	Stochastic Processes	Karl	Saligrama	

COURSE NUMBER	COURSE TITLE	FALL '08	SPRING '09	SUMMER '09
EC512	Enterprise Client-Server Software Systems Design		Skinner	
EC513	Computer Architecture	Herbordt		
EC514	Simulation	Vaikili		
EC515	Digital Communication	Ishwar		
EC516	Digital Signal Processing	Bystrom		
EC517	Introduction to Information Theory		Ishwar	
EC518	Software Project Management		Brackett	
EC520	Image Processing and Communication	Konrad		
EC524	Optimization Theory and Methods	Paschalidis		
EC533	Intro to Discrete Mathematics	Levitin		
EC534	Discrete Stochastic Models		Levitin	
EC535	Intro to Embedded Systems		Qin	
EC541	Computer Communication Networks		Starobinski	
EC544	Networking the Physical World	Little		
EC551	Advanced Digital Design	Taubin		
EC560	Intro to Photonics	Altug	Altug	
EC561	Error-Control Codes	Karpovsky		
EC566	The Atmosphere and Space Environment	Oliver		
EC568	Optical Fiber Sensors	Morse		
EC570	Lasers		Dal Negro	
EC571	VLSI Principles and Applications	Hubbard	Hubbard	
EC574	Physics of Semiconductor Materials	Bellotti		
EC575	Semiconductor Devices		Bellotti	
EC578	Fabrication Technology for Integrated Systems	Klepstyn		
EC579	Microelectronic Device Manufacturing		Cole	
EC580	Modern Active Circuit Design	Knepper		
EC582	RF/Analog IC Design Fundamentals		Knepper	
EC591	Special Topics in ECE Lab	Paiella		

INSTRUCTIONAL LAB EXPENDITURES	
	<i>Approx. Cost</i>
Microprocessor and Software Engineering Labs	\$11,298.95
VLSI and Signals/Networks Lab	\$5,952.39
Electronics Lab	\$10,431.39
Senior Projects Lab	\$36,153.69
Other (includes materials and equipment for courses not assigned to a specific lab)	\$34,699.83
Total	\$98,536.25

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 with actuators and sensors. Various types of controllers (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 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: Herbordt, Hubbard, Knepper, Taubin

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.

Electronics Teaching Laboratory

Faculty: Carruthers, Horenstein, Knepper, Lee, Ruane, Sergienko

The Electronics Teaching Laboratory supports the laboratory component of the core courses EK307 – Electric Circuit Theory, EC410 – Introduction to Electronics, and EC412 – Analog Electronics. In addition, several modules of EK 131/132 – Introduction to Engineering make use of the facility. Staffed by a full-time technician, each of the thirty-six lab benches includes fully digital, PC-linked oscilloscopes, power supplies, multimeters, and function generators. Each networked PC is loaded with OrCAD, PSpice, schematic capture, PCB layout, and LabView software. Some stations are equipped with National Instruments data acquisition hardware. A variety of common electronic parts are available for sale at the equipment window. When not in use by scheduled lab sections, the facility is available for open use by all ECE students. A handicapped-accessible lab station is available.

High Performance Computing Laboratory

Faculty: Brower, Giles

The High Performance Computing Laboratory was created with support from the National Science Foundation to support de-

velopment 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 to supercomputers at the Center for Computational Science and the Scientific Computing and Visualization Lab.

High Tech Tools and Toys Laboratory

Faculty: Ruane

HTTTL is the instructional laboratory associated with Boston University's NSF-funded Engineering Research Center for Subsurface Sensing and Imaging Systems (CenSSIS). The laboratory houses a variety of PC-based imaging camera systems, machine vision systems, and acoustic imaging systems. Software for imaging includes MATLAB, Image Processing Toolbox, Image Builder, ENVI, and LabVIEW. The HTTTL supports freshman EK131/132 modules in imaging and subsurface imaging, senior design capstone projects in imaging, and experiments in senior level electives related to imaging. The lab also hosts summer research through UROP, REU, RET, and High School Honors programs. Some undergrads are supported during the academic year to work on improving stations in the HTTTL.

Microprocessor and PC Laboratory

Faculty: Giles, Skinner, Taubin, Toffoli

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: Knepper, Pisano, Ruane

This lab supports our senior design teams, serving real-world customers such as NASA, Analog Devices, Boston public schools, social service agencies, artists, and small businesses, as well as faculty and staff across the University. Each team has twenty-four hour access to a permanent bench setup with a networked PC, benchtop GPIB-based HP test equipment, and software for schematic design, simulation, and PCB layout. Electronics and shop support is provided. Shared tools include high speed scopes, logic analyzers, spectrum analyzers, E-prom, PLA and FPGA burners, and various compilers and crosscompilers for DSP and micro-controller development. Software from MS-DNAA is available for all teams.

IEEE Student Branch

The ECE Department supports the Boston University student branch of the IEEE. There were three chapter meetings during the 2008-2009 school year. The theme for these meetings was "circuit of the month." Chapter President, Ricardo Fuentes, held

these meetings in the ECE Electronics Laboratory and participating students learned about a new circuit at each meeting, while socializing with classmates.

BUSAT

The Boston University Student satellite for Application and Training was a collaboration between BU and Taylor University and was funded through the Air Force's University Nanosatellite 5 Program (UNP). The UNP is a contest between eleven universities which provided each team with \$110K to construct a working nanosatellite. At the end of two years, the school with the most complete satellite that closest meets Air Force objectives is selected to be launched. Throughout the process, the Air Force

provided opportunities for feedback to the teams through design reviews, expert area teleconferences, and hands-on training workshops. BUSAT had a strong technological objective in a novel bus design and a mission to better understand the coupling between energetic particles in the magnetosphere and their subsequent effect on the ionosphere. PhD student David Voss was the project manager and Professor Theodore Fritz was the PI.

The project was managed by the Center for Space Physics.

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 logbooks. Teams have 24/7 access to their dedicated, 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 4, 2009, eleven teams and three BS Honors Thesis student presented their projects across two parallel sessions. Best presentation awards for each session were presented at a luncheon for faculty, customers, and seniors.

2009 ECE Award for Excellence in Teaching



Professor **JOSHUA SEMETER** (right) was the winner of the 2009 ECE Award for Excellence in Teaching. He received the award for his outstanding contributions to core ECE courses, including circuits and electromagnetics, and his commitment to advising both individual students and the IEEE student branch.

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.

Notable Senior Design Projects

Phoney Money

Cell phones can do that?

It seems that without fail, mobile technology advances at such a rate that the devices we carry with us—everywhere—can do things that we couldn't have imagined only a year before. Who would have thought the brick and battery pack phones of only twenty years ago would transform into super-slim, elegant designs capable of not only making phone calls, but managing email, taking photos, playing video games, browsing the Web, and mapping routes via GPS?

Then again, who would have thought that a phone could replace their wallet?

A team of ECE seniors developed a software system that aims to do just that. "Phoney Money," created by **KEVIN ALLGAIER, BRIANNA CARGES, AMY COSTANDI, BARRY LAI, and JEFF LI**, enables Apple iPhone users to make secure in-store credit card payments—with their phones—and also provides retailers with the means to seamlessly accept those payments. The traditional stack of plastic cards with magnetically encoded strips appears to be the latest casualty of the mobile virtualization trend.

Developing such a system is no simple task, though. It is, in fact, handling people's money.

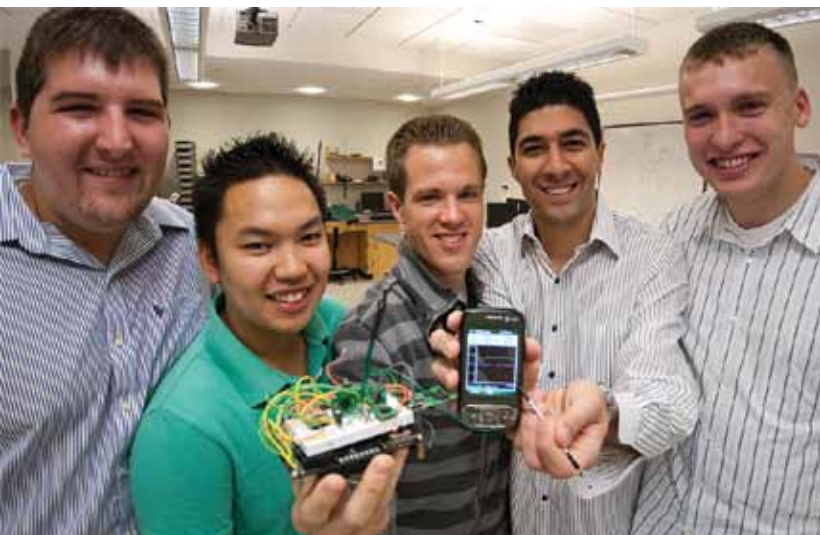
"Because we were focused on creating a real-world product, we faced many challenges in ensuring that our system is both scalable and secure," said the team. "A major issue was determining how the customer's phone and the merchant's point-of-sale system could 'find' each other in order to communicate. Once we determined this, we also spent a great deal of effort researching the protocol to use for message-passing between



the devices. Both of these issues required us to consider cost, implementation difficulty, convenience, security features, and the ability to support a large number of concurrent users."

While this is a new concept for the U.S. market, phone-based payments systems are fairly commonplace in countries such as Japan. But Phoney Money has a unique advantage.

"It doesn't require any special hardware or dedicated credit/debit accounts," said Allgaier. "By focusing on using proven, scalable technologies like Java, MySQL, and XMPP instant messaging, the system allows customers to use the accounts they already have, and merchants can integrate the software directly into their existing PC-based checkout systems."



Intellimonitor

Humans are a mechanically complicated species surrounded by a host self-created obstacles that their bodies were not designed to handle gracefully. The result? Bad posture and a plethora of strange injuries that stem from seemingly harmless activities. Unfortunately, since so much of the physical activity we engage in is unnatural from an anatomical standpoint, we have trouble analyzing what it is that causes us to punish our backs, knees, and shoulders throughout the day.

ECE Senior Design team "The 5 Moniteers" (**CHRISTOPHER ARENSDORF, MATTHEW CAREY, SHAWN FITZPATRICK, MICHAEL TIRGARDON, and ANDREW VELASCO**) hope their IntelliMonitor system will be a positive step toward solving these problems. IntelliMonitor is a personal activity monitoring system optimized for human use that consists of a group of wireless, wearable

activity monitoring devices (AMDs), composed of four MEMS sensors each, that interface with the wearer's Windows Mobile smartphone. By permitting flexible positioning of its nodes, it allows the wearer to see his or her posture and movement in real-time in graphical and model forms that are easily analyzed to determine ways to improve locomotion and posture.

The system also has a number of enhanced features. To improve its corrective capabilities, the AMDs feature vibration feedback that can be set to trigger on specific motions. Also, the device's data can be continuously sent via a wireless connection to a server for remote observation and analysis.

"Because of its configurable nature," said Carey, "the IntelliMonitor can be used for a variety of applications. While it was designed with clinical research in mind, it could also be

employed in applications like geriatric activity tracking, athletic enhancement, and employee monitoring."

Though a solid understanding of both electrical and computer engineering drove the development of the system and its devices, it was the areas that they didn't have a foundation in that truly enlightened the team.

"Some of the greatest challenges that we faced in this project were in understanding the framework of human kinematics that our product was designed around," said Carey. "We were new to the study of human posture and gait. We had to broaden our engineering education and learn more about this study to be successful. More importantly, though, this enforced the idea that a good engineer must engage in lifelong learning in many concentrations."

T-NAV

Boston's Green Line subway riders know well the futility in following the system's published schedule; unless you are catching a train at its origin, you won't see it arrive "on time." Unfortunately, much of the Green Line runs above ground on the same streets as automobile traffic, so its trains are subject to the same stop and go rules of the road. Add in the need to wait for large groups of people to exit and enter the trains at each stop and what you get is a painfully unreliable commute.

ECE Senior Design team "Macrosoft" (**ABIN AJAYAKUMAR, MOSES CHEN, NAEL MUSLEH, CHRISTOPHER OGORZALEK, and PATRICK RASPANTE**) designed an innovative system called "T-NAV" that aims to at least partially solve this problem by adding a measure of predictability to the subway waiting game.

The project is based on a collaborative effort between GPS-enabled cell phone users to create a network of nodes feeding data to a central system. When the T-NAV cell phone application is activated by a user while on a train, the phone will send anonymous position data to a centralized server. The data is then run through a series of calculations and compared to current data and historical data from other users. The result is a system that can predict where the train currently is, and at what times it will arrive at the remaining stations in its route. End-users can then access this information on a public website.

Learning the intricacies of cell phone systems and programming for mobile devices were noted as major hurdles for the project; no one had experience in those areas. But it was the "nitty gritty" that really tested the team's ability to successfully complete the system.

"Since the project consisted of many sub-components that were being developed in parallel, it was particularly hard to make it all work together," said Ogorzalek. "Everyone knew that the project was 'almost done,' and it was that way for a good three to four months before we could actually demonstrate full functionality. Small things like a website pop-up window grabbing data from the central server in the wrong way, or a minor bug in the train motion logic, created cascading problems. Resolving these issues required a lot of testing and debugging time and a lot of patience with teammates. Communication and cooperation was key."



Graduate Program

Recruitment

Three new PhD students were awarded Dean's Fellowships (DFs) and matriculated in Fall 2008. All three of these students will be continuing their degree programs and are making excellent progress. Fifteen new graduate students matriculated with Graduate Teaching Fellowships (GTFs) in the same period; seven of these students were offered Research Assistantships (RAs) for the Fall 2009 semester. We also recruited seventeen new funded PhD students for the Fall 2009 semester: one Dean's Fellow, thirteen GTFs, two RAs, and one Photonics Fellow.

We received 565 applications for the Fall 2009 semester,

and offered admission to a total of 300 students; 249 of which were to the MS program (84 of these applied for the post-BS PhD program). Thirty-four students were offered admission as post-BS PhDs and seventeen as post-MS PhDs.

The numbers indicate a recruiting cycle comparable to prior years in terms of overall volume. However, for the Fall 2009 period we have secured a new class of funded PhD students by using fewer financial aid and admissions offers. This suggests the increased competitiveness of our offer package and the desirability of our program.

NEW MATRICULANTS 2008-2009

		Male	Female	FT	PT	GTF	RA	Fellow	DF
MS	US	11	5	9	7	0	1	0	0
	Intl.	21	8	29	0	0	0	0	0
PHD	US	6	1	6	1	6	0	0	2
	Intl.	9	4	13	0	11	0	0	1
Total		47	18	57	8	17	1	0	2

FALL 2008 MEAN GRE SCORES

		Verbal	%	Quantitative	%	An. Writing	%
MS	US	514	59	730	79	4.23	53
	Intl.	455	48	773	88	3.69	26
PHD	US	557	74	788	92	4.58	56
	Intl.	531	66	767	89	3.8	29
Mean		514	62	765	87	4	41

SPRING 2009 MEAN GRE SCORES

		Verbal	%	Quantitative	%	An. Writing	%
MS	US	410	36	620	53	3.5	22.5
	Intl.	430	40	800	94	4	18
PHD	US	570	79	780	90	4.5	54
	Intl.	250	1	790	92	3	8
Mean		415	39	748	82	4	26

Graduate Enrollment

MS Degree Enrollment

PROGRAM	ENROLLMENT
Computer Systems Engineering	40
Electrical Engineering	46
Photonics	5
Total	91

PhD Degree Enrollment

PROGRAM	ENROLLMENT
Computer Engineering	16
Electrical Engineering	81
Systems	2
Total	99

Graduate Degrees

MS Degrees Awarded

PROGRAM	ENROLLMENT
Computer Systems Engineering	28
Electrical Engineering	24
Photonics	3
Total	55

PhD Degrees Awarded

PROGRAM	ENROLLMENT
Computer Engineering	4
Electrical Engineering	15
Total	19

Course and Program Development

The ECE Department continues to refine the graduate curriculum, with one new course developed and offered during 2008-2009. In addition, three courses that were developed as special topics were approved to become part of the regular curriculum and were assigned course numbers.

In Spring 2009, one new course was offered: EC500 - Electronic Optical and Magnetic Properties of Materials by Prof. **THEODORE MOUSTAKAS**. During the year, this course, as well as two others that were originally developed as special topics courses (EC500 and EC700), were given course numbers and entered into the course inventory:

- » EC728 - Design and Testing for Distributed Software-Intensive Systems
- » EC573 - Solar Energy Systems
- » EC577 - Electronic Optical and Magnetic Properties of Materials

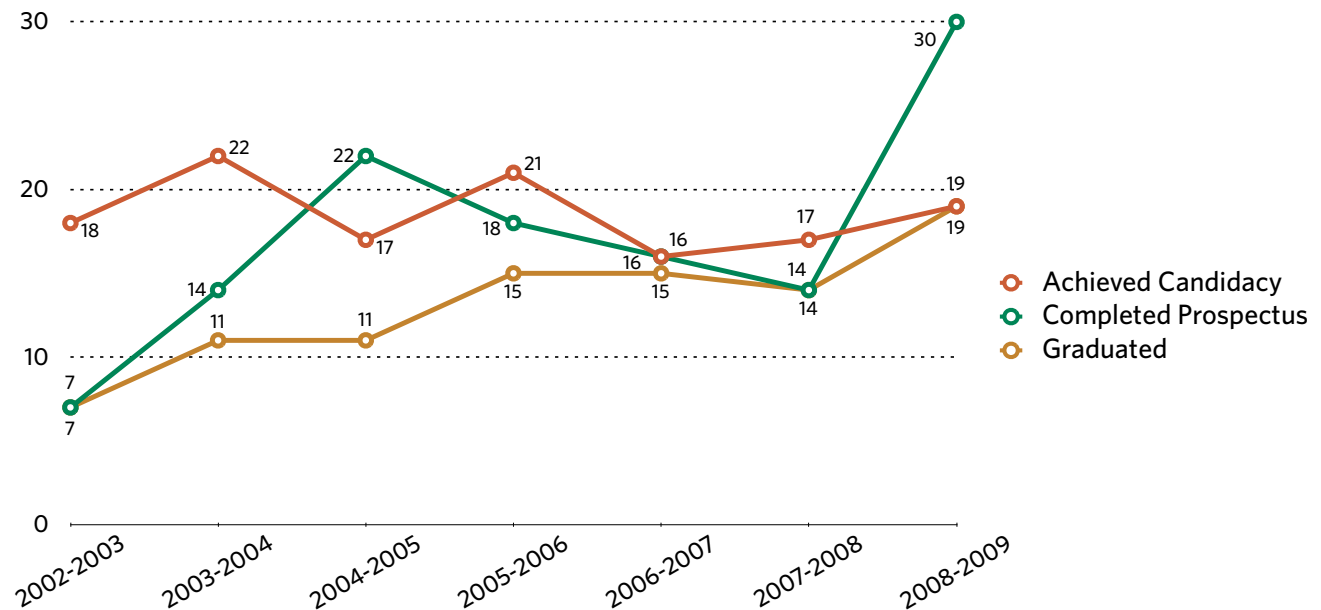
There were also two courses developed by the Systems Division and approved by ECE faculty to be cross-listed in ECE:

- » SE/EC543 - Sustainable Power Systems: Planning, Operation and Markets
- » SE/EC734 - Hybrid Systems

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 prospectus defense, and graduating over the last four academic years.



Graduate Teaching Fellows and Research Assistants

	SUMMER 2008	FALL 2008	SPRING 2009	TOTAL
Graduate Teaching Fellows	4	19	19	42
Research Assistants	83	103	89	275

PhD Dissertations

STUDENT NAME	DISSERTATION ADVISOR	DISSERTATION TITLE
Aeron, Shuchin	Saligrama, Venkatesh	Efficient Sensing and Reconstruction of Sparse Phenomena: Bounds and Algorithms
Atia, George	Saligrama, Venkatesh	Robust Strategies for Cooperative and Cognitive Wireless Communication Systems
Chang, Shey-Sheen	Nawab, S. Hamid	Emergent Behavior Search in Precision Decomposition of EMG Signals
Diaz, Marcos	Semeter, Joshua	Particle-in-Cell Simulation of Electron Beam Instabilities in the Ionosphere and Their Effect on ISR Spectra
Driscoll, Kristina	Paiella, Roberto	Novel Nitride and Silicon-Based Quantum Structures for Intersubband Light Emitting Devices
El Katerji, Ahmad	Mountain, David	Brainview: A Functional Neuroanatomy Knowledge System
Keene, Samuel	Carruthers, Jeffrey	Cross Layer Techniques for Collision Recovery in Wireless LANs
Kulikowski, Konrad	Karpovsky, Mark	Codes and Circuits for Secure Hardware Design
Lu, Shan	Hubbard, Allyn	A Nonlinear Multicompartmental Cochlear Model
Ozkumur, I. Emre	Ünlü, M. Selim	Optical Interference Based Microarray Imaging for Label-free Multi-Analyte Detection
Rodriguez-Diaz, Eladio	Castañón, David Bigio, Irving	Pattern Recognition Algorithms for Diagnosis/Screening of Cancer Using Elastic-Scattering Spectroscopy
Savas, Onur	Alanyali, Murat	Consensus Algorithms for Power-Constrained Wireless Sensor Networks
Smirnov, Alexandre	Taubin, Alexander	Asynchronous Micropipeline Synthesis System
Stern, Alvin	Cole, Daniel	Design and Analysis of a Novel Avalanche Photodiode
Stewart, Jason	Bifano, Thomas	Development and Control of a New Class of Segmented Deformable Mirrors for Advanced Astronomical Imaging Applications
Yalcin, Ayca	Ünlü, M. Selim	Spectral fluorescence measurements on reflecting surfaces shedding light onto conformation and orientation of macromolecules
Zettegren, Matthew	Semeter, Joshua	Model-based Optical and Radar Remote Sensing of Transport and Composition in the Auroral Ionosphere

Graduate Courses

COURSE NUMBER AND TITLE		FALL '08	SPRING '09	SUMMER '09
EK501	Math Methods I	Kotiuga		
EC500	Special Topics in ECE		Moustakas	
EC501	Dynamic Systems Theory	Dupont		
EC504	Advanced Data Structure			
EC505	Stochastic Processes	Karl	Saligrama	
EC512	Enterprise Client-Server Software Systems Design		Skinner	
EC513	Computer Architecture	Herbordt		
EC514	Simulation	Vaikili		
EC515	Digital Communication	Ishwar		
EC516	Digital Signal Processing	Bystrom		
EC517	Introduction to Information Theory		Ishwar	
EC518	Software Project Management		Brackett	
EC520	Image Processing and Communication	Konrad		
EC524	Optimization Theory and Methods	Paschalidis		
EC533	Intro to Discrete Mathematics	Levitin		
EC534	Discrete Stochastic Models		Levitin	
EC535	Intro to Embedded Systems		Qin	
EC541	Computer Communication Networks		Starobinski	
EC544	Networking the Physical World	Little		
EC551	Advanced Digital Design	Taubin		
EC560	Intro to Photonics	Altug	Altug	
EC561	Error-Control Codes	Karpovsky		
EC563	Fiber-Optic Communication Systems			
EC566	The Atmosphere and Space Environment	Oliver		
EC568	Optical Fiber Sensors	Morse		
EC570	Lasers		Dal Negro	
EC571	VLSI Principles and Applications	Hubbard	Hubbard	
EC574	Physics of Semiconductor Materials	Bellotti		
EC575	Semiconductor Devices		Bellotti	
EC578	Fabrication Technology for Integrated Systems	Klepstyn		
EC579	Microelectronic Device Manufacturing		Cole	
EC580	Modern Active Circuit Design	Knepper		
EC582	RF/Analog IC Design Fundamentals		Knepper	
EC591	Special Topics in ECE Lab	Paiella		
EC700	Advanced Topics in Electrical and Computer Engineering	Brackett		
EC710	Dynamic Programming and Stochastic Control		Caramanis	

COURSE NUMBER AND TITLE		FALL '08	SPRING '09	SUMMER '09
EC713	Parallel Computer Architecture		Herbordt	
EC717	Image Reconstruction and Restoration		Karl	
EC719	Statistical Pattern Recognition	Saligrama		
EC724	Advanced Optimization Theory and Methods		Paschalidis	
EC725	Queueing Systems	Perkins		
EC726	Personal Knowledge Engineering		Toffoli	
EC730	Information-Theoretical Design of Algorithms		Levitin	
EC752	Theory of Computer Hardware Testing	Karpovsky		
EC757	Advanced Microprocessor Design			Montazam
EC761	Information Theory and Coding	Levitin		
EC763	Nonlinear and Ultrafast Optics	Saleh		
EC764	Optical Measurement	Swan		
EC765	Biomedical Optics and Biophotonics		Mertz	
EC771	Physics of Compound Semiconductor Devices	Bellotti		
EC774	Semiconductor Quantum Structures and Phononic Devices		Paiella	

Instructional Laboratories

IMSIP Instructional Laboratory

Faculty: Karl, Konrad, Nawab, Oliver

This laboratory serves the graduate instructional needs of the Department in the areas of multidimensional signal processing (including image and video processing), statistical signal processing, pattern recognition, and 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 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: Bigio, Morse, Paiella, Ruane, Saleh, Teich, Ünlü

This lab supports introductory and intermediate level courses in the MS in Photonics program. Four stations have vibration isolated optical tables, 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.

RF Measurements Lab

Faculty: Knepper

The RF Measurements Lab provides an opportunity to train students in advanced radio frequency experimental techniques. The lab contains up-to-date high frequency equipment for testing RF printed circuit boards, MMICs, and other high frequency components in the frequency range 100 MHz to 26 GHz. The lab is used for both undergraduate and graduate instruction for courses SC580 and SC582, as well as for research in coupled electrical substrate noise effects in RF/mixed-signal IC technology. Included in the RF Measurements Lab are recent Agilent high frequency tools: a 26 GHz vector network analyzer, 26 GHz spectrum analyzer, high frequency oscilloscope, and RF signal generator. Students use the equipment to learn the basics of S-parameter measurements, as well as characterization of RF mixers, VCOs, amplifiers, and other components.

Signals and Networks (SIGNET) Laboratory

Faculty: Bystrom, Carruthers, Konrad, Nawab

This laboratory provides instructional facilities for courses in the areas of signal processing and communication networks. The lab 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, digital cameras, and software packages such as MATLAB and Hyperception. The courses served by this laboratory include SC401 (Signals and Systems), SC415 (Communication Systems), SC416 (Intro to Digital Signal Processing), SC 512 (Digital Signal Processing), and some ECE modules in EK130 (Introduction to Engineering). 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 for experimentation with local-area network switching and routing hardware.

Software Engineering Laboratory

Faculty: Brackett, Herboldt, Skinner, Taubin, Toffoli, Trachtenberg

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 lab is comprised of more than twenty-five networked workstations, four Motorola embedded computer development systems, and state-of-the art development and modeling tools for the design, implementation, and testing of distributed software systems.

Colloquia & Seminars

The ECE Colloquium Series and Department Spotlight Seminar (DSS) series continued for another successful year. Prominent speakers from inside and outside the University delivered engag-

ing research talks on current issues to graduate students, faculty, and other students and guests from the greater Boston area.

DATE	SPEAKER	TITLE
9/10/2008	Dr. Marcella Chiari Institute of Chemistry of Molecular Recognition National Research Council, Italy	Integration of Materials and Functions in Microfluidic Devices
9/11/2008	Alexander Taubin Electrical & Computer Engineering Boston University	Automated Asynchronous Fine-Grain Pipelining in Mitigation of Timing Variability and Hardware Security Applications ^b
9/15/2008	Roberto Paiella Electrical & Computer Engineering Boston University	Novel Semiconductor Quantum Structures for Intersubband Device Applications: from Ultrafast All-Optical Switching to Terahertz Light Emission
9/22/2008	Vincent Harris Electrical and Computer Engineering Northeastern University	Advances in Microwave Ferrites: A New Twist on Old Materials ^a
10/6/2008	Ertem Tuncel Electrical Engineering University of California Riverside	When Channel Does the Binning: A Joint Source-Channel Coding Approach for Broadcast Channels
10/9/2008	Elizabeth Dobisz San Jose Research Center Hitachi Global Storage Technologies	Nanofabrication for Patterned Magnetic Media
10/9/2008	Richard Tiberio Center for Nanoscale Science and Technology Stanford University	Electron Beam Lithography for Integrated Optics
10/20/2008	Ajay Joshi Integrated Systems Group Massachusetts Institute of Technology	Building Many-Core Logic-to-Memory Networks Using Monolithic Silicon Photonics
11/4/2008	Russell Tessier Electrical & Computer Engineering University of Massachusetts Amherst	Memory Security Management for Embedded Systems
11/6/2008	Jelena Kovacevic Center for Bioimage Informatics Carnegie Mellon University	Problems in Biological Imaging: Opportunities for Signal Processing
11/12/2008	Keigo Hirakawa Engineering and Applied Sciences Harvard University	Enhancing Image Fidelity through Spatio-Spectral Design for Color Image Acquisition, Reconstruction, and Display
11/17/2008	Richard Soref Sensors Directorate U.S. Air Force Research Laboratory	Silicon-based Longwave Integrated Optoelectronics
11/17/2008	Vahid Tarokh Electrical Engineering Harvard University	Capacity Bounds and Signaling Schemes for Bi-Directional Coded Cooperation Protocols
11/24/2008	Katherine Compton Electrical and Computer Engineering University of Wisconsin	System-Level Support for Reconfigurable Computing

DATE	SPEAKER	TITLE
12/3/2008	Gyula Eres Materials Science and Technology Division Oak Ridge National Laboratory	Growth Related Kinetic Effects in Vertically Aligned Nanotube Array Properties
12/4/2008	Jacob Khurgin Electrical Engineering Johns Hopkins University	Linear and Nonlinear Optical Devices Based on Slow Light Propagation: Figures of Merit
12/8/2008	Siddharth Ramachandran OFS Laboratories	Non-Zero-Order Light: Beams That Can Do What a Gaussian Cannot
12/10/2008	Saul Youssef Center for Computational Science Boston University	Simple Cyberinfrastructure
12/15/2008	Marvin Minsky Artificial Intelligence Laboratory Massachusetts Institute of Technology	Missteps toward Artificial Intelligence ^a
1/16/2009	Stephen Cronin Electrical Engineering University of Southern California	One-Dimensional Physics in Individual Suspended Carbon Nanotubes
1/28/2009	Patrick Thiran School of Computer and Comm. Sciences Ecole Polytechnique Fédérale de Lausanne	Fairness, Spatial Reuse and Phase Transition in CSMA/CA Wireless Networks ^a
1/30/2009	Warren J. Gross Electrical and Computer Engineering McGill University	Algorithms and Architectures for Signal Processing and Scientific Computing on FPGAs
2/18/2009	Yehia Massoud Electrical and Computer Engineering Rice University	Modeling and Design Solutions for Emerging and Nanoscale Computing Systems
3/3/2009	Ajay Joshi Integrated Systems Group Massachusetts Institute of Technology	Interconnect Design: From Emerging Devices to Energy-efficient Networks
3/16/2009	Sharon Goldberg Electrical Engineering Princeton University	Securing Internet Routing
3/17/2009	Christopher Batten Electrical Engineering and Computer Science Massachusetts Institute of Technology	Manycore Vector-Thread Architectures
3/18/2009	Amy Reibman Comm. Sciences and Artificial Intelligence AT&T Labs Research	Monitoring Video Quality Inside a Network ^a
3/19/2009	Deniz Gunduz Electrical Engineering Princeton University	Cross-layer Design for Wireless Networks without Sacrificing Modularity
3/23/2009	Sergey Rudin Electro-Optics and Photonics Division U.S. Army Research Laboratory	Non-linear plasma waves in gated graphene and application for the detection of terahertz signals
3/25/2009	Noel Giebink Electrical Engineering and Physics Princeton University	Advances in organic light emitting diodes and lasers
3/25/2009	Diana Young Media Lab Massachusetts Institute of Technology	From Music Performance to Rehabilitation: Measuring Human Motion Using Local Sensing Systems

DATE	SPEAKER	TITLE
3/26/2009	Tammara Massey Computer Science Department University of California Los Angeles	Data Driven and Optimization Techniques for Mobile Health Systems
3/30/2009	Dr. Joseph Rizzo Center for Innovative Visual Rehabilitation Massachusetts Eye and Ear Infirmary	Engineering Technologies for Retinal Prosthetic Devices to Restore Vision to the Blind: What is the Visual Potential of these Devices?
3/31/2009	Jing Li Electrical and Computer Engineering Purdue University	Robust Heterogeneous Systems in Emerging Technologies: A TFT-CMOS 3D System for Testable/Reliable Operation
4/2/2009	Suhas Diggavi School of Computer and Comm. Sciences Ecole Polytechnique Fédérale de Lausanne	Wireless Network Information Flow
4/6/2009	Gerasimos Konstantatos Electrical and Computer Engineering University of Toronto	Solution-processed quantum dot photodetectors
4/9/2009	Ayse Coskun Computer Science and Engineering University of California San Diego	Efficient Dynamic Thermal Management for Multiprocessor Systems
4/13/2009	Yunsi Fei Electrical and Computer Engineering University of Connecticut	Machine-Learning-based Adaptive Network Design for Lifetime Extension in Underwater Sensor Networks
4/30/2009	Lara Dolecek Lab. for Information and Decision Systems Massachusetts Institute of Technology	High-Speed Complex Systems: Harnessing Core Structures and Randomness
5/1/2009	Irena Knezevic Electrical and Computer Engineering University of Wisconsin Madison	Thermoelectric properties of silicon nanowires
5/7/2009	Vinod Prabhakaran Coordinated Science Laboratory University of Illinois, Urbana-Champaign	Wireless Interference Management: A Fundamental Approach
5/11/2009	Christina Fragouli School of Computer and Comm. Sciences Ecole Polytechnique Fédérale de Lausanne	Properties and Applications of Network Coding

*a ECE Colloquium Series
b Research Spotlight Seminar*



Marvin Minsky, Massachusetts Institute of Technology

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 Systems and Sciences, which includes signal and image processing, control and communication systems, and networks; and Computer Systems 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 collaboratives.

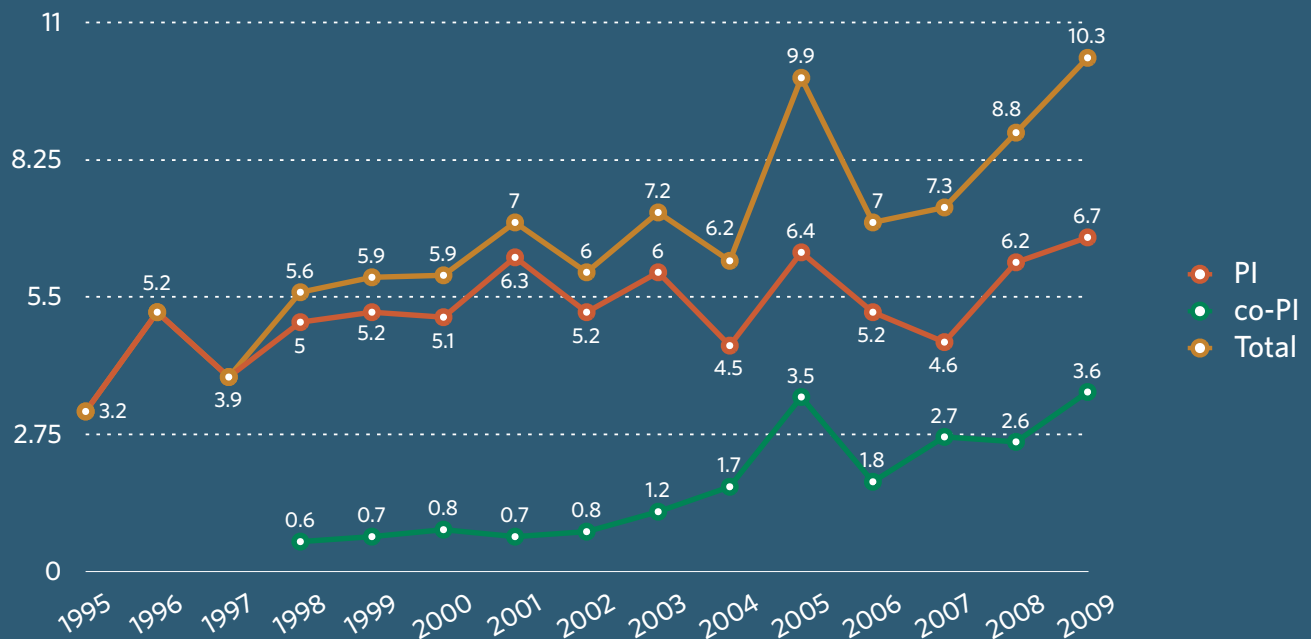
External Research Funding

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 \$6.5M in the 2000-2004 period, and \$4.8M in 1995-99.

The following tables delineate the new and continuing grants awarded over the 2009 fiscal year. The funding level for

new grants, where an ECE faculty member is the Principal Investigator (PI) is approximately \$6.7M. 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 \$3.6M. The total of new grants is therefore approximately \$10.3M.

History of External Research Funding (millions of dollars)



New Grants with ECE Principal Investigators

RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END	AMOUNT
Altug, Hatice	SGER: Investigation of Plasmonic Crystal Based Nanostructures for Biomolecule Detection (w/ Photonics Center & CNN)	National Science Foundation (NSF)	10/1/2008	9/30/2009	\$55,000
Altug, Hatice	Development of Multiplexed, Ultra-Sensitive, Label-Free and Rapid Biosensing Technologies for Proteomics and Virus Detection Applications	Comm. of Mass./ Life Sciences Center	9/1/2008	8/31/2009	\$91,780
Bellotti, Enrico	SBIR: Development of Low Stress Ohmic Contacts to HgCdTe (Subcontract via Photronix, Inc.)	Department of Defense (DOD)	9/22/2006	12/14/2008	\$697
Bellotti, Enrico	Theoretical Investigation of Optoelectronic Devices Based on ZnO Material System	National Science Foundation	6/1/2009	5/31/2012	\$311,360
Cassandras, Christos	Real-Time Optimization in Complex Stochastic Environments (in conj. with CISE)	Department of Defense	3/1/2009	11/30/2009	\$123,105
Castañón, David	Center for Subsurface Sensing and Imaging Systems -- Research Thrust 2 - Core MVT (Subcontract via Northeastern)	National Science Foundation	9/1/2008	8/31/2009	\$196,487
Castañón, David	ALERT: Awareness and Location of Explosives-Related Threats (in conj. w/ CISE) (Subcontract via Northeastern)	Department of Homeland Security	7/1/2008	6/30/2009	\$100,000
Castañón, David Karl, W. Clement	MURI: Fusion and Sensor Management for Automatic Target Exploitation (in conjunction with CISE) (subcontract via Ohio State University Research Foundation)	Department of Defense	5/1/2009	9/30/2009	\$124,896
Castañón, David Cassandras, Christos	Distributed Mission Control for Unmanned Air Vehicles in Stochastic Environments (in conjunction with CISE)	Department of Defense	7/1/2007	11/30/2009	\$177,614
Castañón, David Karl, W. Clement	MURI: Fusion and Sensor Management for Automatic Target Exploitation (in conjunction with CISE) (subcontract via Ohio State University Research Foundation)	Department of Defense	10/1/2008	4/30/2009	\$142,278
Castañón, David Karl, W. Clement Saligrama, Venkatesh	ALERT: Awareness and Location of Explosives-Related Threats (in conj. w/ CISE) (Subcontract via Northeastern)	Department of Homeland Security	7/1/2008	6/30/2009	\$274,999
Dal Negro, Luca	Nanoarray-Assisted Wavelength Shifting Films for Solar Applications	Lightwave Power, Inc.	2/1/2009	1/31/2010	\$61,045
Dal Negro, Luca	MURI: Electrically-Pumped, Silicon-Based Lasers for Chip-Scale Nanophotonic Systems (subcontract via MIT)	Department of Defense	7/1/2006	6/30/2009	\$58,333
Dal Negro, Luca	Biodegradable Communications System (subcontract via Tufts University)	Department of Defense	1/1/2008	10/31/2009	\$30,710
Dal Negro, Luca	Biodegradable Communications System (subcontract via Tufts University)	Department of Defense	1/1/2008	1/31/2011	\$118,830
Dal Negro, Luca	MURI: Electrically-Pumped, Silicon-Based Lasers for Chip-Scale Nanophotonic Systems (Subcontract via MIT)	Department of Defense	7/1/2006	11/30/2009	\$44,834
Herbordt, Martin	FPGA-Based High Performance Computing	HHS/NIH/NCRR	5/1/2009	4/30/2010	\$278,688
Horenstein, Mark	STTR Phase II: Low Power MEMS Retroreflectors for Optical Communication (Subcontract via Boston Micromachines Corp.)	Department of Defense	11/1/2007	10/31/2009	\$123,445

RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END	AMOUNT
Horenstein, Mark Sherr, David	Transdermal Injection of Nanoparticles via Electrospray and Pulsed-Field Assist (Subcontract via MGH/CIMIT)	Department of Defense	4/14/2008	3/21/2009	\$6,300
Hubbard, Allyn	Clare Booth Luce Fellowship	Luce Foundation	8/1/2008	7/31/2009	26,958
Ishwar, Prakash	CIF: Small: Collaborative Research: Towards a Paradigm-Shift in Distributed Information Processing - Harnessing Group Structure and Interaction (in conj. w/ CISE)	National Science Foundation	7/1/2009	6/30/2012	\$249,999
Karl, W. Clement	Foundation for Automatic Target Recognition (in conjunction with CISE)	Department of Defense	12/1/2008	11/30/2009	\$87,462
Karl, W. Clement	2009 IEEE International Symposium on Biomedical Imaging (ISBI)	HHS/NIH/NIBIB	2/9/2009	2/8/2010	\$15,000
Karl, W. Clement	2009 IEEE International Symposium on Biomedical Imaging (ISBI)	DOHHS	2/9/2009	2/8/2010	\$5,000
Lee, Min-Chang	Controlled Studies of Whistler Wave Interactions and Endergetic Particles in Radiation Belts	Department of Defense	12/1/2008	2/28/2009	\$25,000
Lee, Min-Chang	Investigation of Ionospheric Turbulence and Whistler Wave Interactions with Space Plasmas	Department of Defense	6/1/2009	11/30/2009	\$206,992
Lee, Min-Chang	Deployment of Geo-Magnetic Observatory Systems at Arecibo, PR and Magnetic Conjugate Point in Argentina for Study of Radio Wave-Induced Micropulsations (DURIP)	Department of Defense	6/1/2009	5/31/2010	\$129,000
Little, Thomas Carruthers, Jeffrey Altug, Hatice	NSF Engineering Research Center for Smart Lighting (Subcontract via Rensselaer Polytechnic Institute) (in conj. with CISE)	National Science Foundation	9/1/2008	8/31/2009	\$625,000
Little, Thomas Konrad, Janusz Ishwar, Prakash	NeTS-NOSS: Localized Computation and Network Path Formation to Enable Pervasive Video Sensing (REU Supplement) (in conjunction with CISE)	National Science Foundation	5/1/2008	8/31/2009	\$12,000
Little, Thomas Konrad, Janusz Ishwar, Prakash	NeTS-NOSS: Localized Computation and Network Path Formation to Enable Pervasive Video Sensing (in conj. with CISE)	National Science Foundation	9/1/2009	8/31/2010	\$150,000
Morse, Theodore	A New Approach to High-Power, Eye-Safe, Laser Technology Applications (in conjunction with CNN)	Department of Defense	6/1/2007	8/31/2010	\$250,000
Morse, Theodore	A Novel Broad-Band Light Source for Advanced Fiber Optic Gyroscope System	Draper Laboratories	7/1/2008	6/26/2009	\$124,999
Morse, Theodore	HOM Fibers for Blue Laser Applications	DOD	11/1/2008	10/31/2009	\$100,000
Morse, Theodore	A New Approach to High-Power, Eye-Safe, Laser Technology Applications (in conjunction with CNN)	Department of Defense	6/1/2007	8/31/2010	\$500,000
Moustakas, Theodore	Growth and Characterization of AlGaIn Quantum Wells on Silicon Carbide for Edge Emission at 235 nm (SBIR Phase I) (Subcontract via Photon Systems, Inc.)	NASA	1/22/2009	7/22/2009	\$33,318
Oliver, William	CEDAR: Meteor Plasmas - Theory, Simulations and Observations	National Science Foundation	1/1/2009	12/31/2009	\$101,000
Paiella, Roberto	Plasmonic Band-Structure Engineering for Light-Emission Efficiency Enhancement	Department of Energy	8/15/2008	8/14/2009	\$101,653

RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END	AMOUNT
Paiella, Roberto	Collaborative Research: Quantum-Cascade-Laser Active Materials Based on Silicon-Germanium Nanomembranes	National Science Foundation	7/1/2009	6/30/2010	\$75,790
Paiella, Roberto Moustakas, Theodore Bellotti, Enrico	GaN-Based Quantum-Structure Devices for THz Light Emission and Photodetection (in conj. with the Photonics Center)	National Science Foundation	9/1/2008	8/31/2011	\$399,967
Paschalidis, Ioannis Cassandras, Christos	Distributed Wireless Sensor Networks for Long-Term Deployments (in conj. w/ CISE)	Department of Energy	9/1/2008	8/31/2009	\$252,000
Qin, Wei	Rendezvous Finite State Machine: Where TLM Meets RTL	Semiconductor Research Corporation	8/1/2007	7/31/2009	\$60,000
Ruane, Michael	CenSSIS -- Education Program (Subcontract via Northeastern Univ.)	National Science Foundation	9/1/2008	8/31/2009	\$39,693
Saleh, Bahaa Teich, Malvin	Quantum Optical Coherence Tomography (CenSSIS Supplement) (Subcontract via Northeastern University)	National Science Foundation	9/1/2008	8/31/2009	\$35,000
Saligrama, Venkatesh	CAREER: A Systems Approach to Networked Decision Making in Uncertain Environments (in conj. w/CISE)	National Science Foundation	6/1/2005	5/31/2009	\$80,000
Saligrama, Venkatesh	Networked Sensing Systems for Urban Target Recognition (in conj. w/CISE)	Department of Defense	12/31/2005	12/30/2008	\$49,000
Semeter, Joshua	CAREER: Magnetosphere-Ionosphere Coupling Through Multi-Sensor Data Fusion	National Science Foundation	5/1/2009	4/30/2010	\$81,997
Starobinski, David Trachtenberg, Ari	Self-Forming Extensible Lunar Extra Vehicular Activity Network (SELENE) Phase II (in conjunction with CISE) (Subcontract via Scientific Systems Company, Inc.)	NASA	3/18/2009	2/11/2011	\$113,489
Swan, Anna	REU Supplement - Vibrational and Electronic Aspects of Carbon Nanotubes and Their Interactions	National Science Foundation	10/14/2008	8/31/2010	\$7,000
Teich, Malvin Saleh, Bahaa Sergienko, Alexander	Quantum Imaging: New Methods and Applications (MURI) (subcon. via University of Rochester) (in conj w/Photonics Center)	Department of Defense	5/1/2005	9/30/2009	\$204,381
Teich, Malvin Saleh, Bahaa Sergienko, Alexander	Quantum Imaging: New Methods and Applications (MURI) (subcontract via University of Rochester) (in conjunction with Photonics Center)	Department of Defense	5/1/2005	9/30/2009	\$22,730
Teich, Mavin	Center for Subsurface Sensing and Imaging Systems -- Research Thrust 1-Photonics (Subcontract via Northeastern Univ.)	National Science Foundation	9/1/2008	8/31/2009	\$84,090
Trachtenberg, Ari	A Theory of Monitoring Based on Identifying Codes and Their Variants (REU Supplement)	National Science Foundation	5/1/2009	9/30/2010	\$12,000
Trachtenberg, Ari Starobinski, David	Secure and Efficient Data Distribution in Varying-Topology Networks (in conjunction with CISE)	Deutsche Telekom AG (Germany)	7/1/2008	8/31/2009	\$55,518
Ünlü, M. Selim	High Speed Diagnostic of Temperature and Intensity Variation of Diode-Laser Facets (subcontract via Science Research Laboratory, Inc.)	Department of Defense	10/15/2008	7/31/2008	\$32,999
Ünlü, M. Selim	Research Agreement	The Mitre Corp.	6/1/2009	10/2/2009	\$10,000
SUBTOTAL	GRANTS WITH ECE PIs				\$6,679,436

New Grants with ECE co-PIs

RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END	AMOUNT
Doerrer, Linda Starobinski, David	EMT/NANO: Single Atom Wide Wires with Insulation - New Paradigm for Ballistic Transport (in conj. with CNN) (\$125,000)	NSF	9/1/2008	8/31/2011	\$62,500
Wagenaar, Robert Little, Thomas	Body-Area Instrumentation (LIFT Monitor) for Avoidance of Workplace Injury (in conjunction with CISE) (\$78,442)	The Hartford	10/1/2008	12/31/2008	\$39,221
De Luca, Carlo Roy, Serge Nawab, S. Hamid Jabre, Joe	Wearable-Sensor System for Monitoring Motor Function (\$637,832)	HHS/NIH/ NIBIB	9/1/2008	8/31/2009	\$159,458
Campbell, David Horenstein, Mark	No Longer a Dream Deferred: Greater Minority STEM Participation through Academic and Institutional Change - Participant Support Costs (subcontract via Umass, Amherst) (\$40,295)	NSF	3/1/2006	2/28/2010	\$20,148
Campbell, David Horenstein, Mark	No Longer a Dream Deferred: Greater Minority STEM Participation through Academic and Institutional Change - Participant Support Costs (subcontract via Umass, Amherst) (\$85,200)	NSF	3/1/2006	2/28/2010	\$42,600
Wagenaar, Robert Little, Thomas	Continuous Monitoring of Functional Activities in Home and Community-Based Settings (subcontract via Boston Medical Center) (\$73,125)	HHS/NIH/ NIA	9/1/2008	5/31/2009	\$36,563
Roy, Ronald	Center for Subsurface Sensing and Imaging Systems Research Thrust 1 - Acoustics (subcontract via Northeastern) (\$151,484)	NSF	9/1/2008	8/31/2009	\$151,484
Baillieul, John Castañón, David	Behavioral Dynamics in the Cooperative Control of Mixed Human/Robotic Teams (MURI-07) (in conj. w/ CISE) (\$1,393,925)	Department of Defense/ Air Force	12/1/2008	11/30/2009	\$696,963
De Luca, Carlo Nawab, S. Hamid	Harnessing Motoneuron Activity: From Lab to Clinic (\$562,835)	DOHHS	6/1/2009	5/31/2010	\$281,417
Giles, Roscoe	BPC-A-Empowering Leadership: Computing Scholars of Tomorrow (Subcontract via Rice University) (\$42,499)	National Science Foundation	3/1/2007	2/28/2010	\$42,499
Dal Negro, Luca	COBRA Detection: SERS Engineered Substrates (\$289,140)	DOD/Army	7/1/2008	6/30/2009	\$289,140
Ünlü, M. Selim	COBRA Diagnosis: Spectral Reflectance Imaging Biosensors (\$484,285)	DOD/Army	7/1/2008	6/30/2009	\$484,285
Moustakas, Theodore Paiella, Roberto Bellotti, Enrico	Development of High Efficiency Non-Polar and Semi-Polar UV LED's for Biochemical Threats Detection (\$254,309)	DOD/Army	7/1/2008	6/30/2009	\$254,309
Morse, Theodore Bystrom, Maja Saleh, Bahaa	Ultra High Resolution Digital X-ray for Clinical Applications (\$248,865)	DOD/Army	7/1/2008	6/30/2009	\$248,865
Altug, Hatice Ünlü, M. Selim	Rapid, Portable Biosensors for Virus Detection (\$100,000)	DOD/Army	7/1/2008	6/30/2009	\$100,000

RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END	AMOUNT
Dal Negro, Luca	Bio-Compatible Label-Free Colormetric Responder (\$100,000)	DOD/Army	7/1/2008	6/30/2009	\$100,000
Sergienko, Alexander	RADSCAN: Portable IR Laser Bio-Dosimetry Radiation Scanner (\$250,000)	DOD/Army	7/1/2008	6/30/2009	\$250,000
Hubbard, Allyn	Miniaturized Digital Electronics for a Biomimetic Acoustic Sniper Detection and Localization System (\$175,000)	DOD/Army	7/1/2008	6/30/2009	\$175,000
Morse, Theodore	High Performance Incoherent Light Source for fiber Optical Gyro (\$100,000)	DOD/Army	7/1/2008	6/30/2009	\$100,000
Moustakas, Theodore	Development of III Nitride Based UV LED's for Biochemical Threat Detection (\$100,000)	DOD/Army	7/1/2008	6/30/2009	\$100,000
Subtotal	Grants With ECE co-PIs				\$3,634,451
GRAND TOTAL					\$10,313,887

Continuing Grants

RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END
Saligrama, Venkatesh	Automatic Dispersion Extraction from Acoustic Array Data	Schlumberger	1/1/2007	12/31/2009
Moustakas, Theodore Paiella, Roberto	Ultraviolet Electroabsorption Modular Based on III-Nitride Quantum Wells	NSF	9/1/2007	8/31/2010
Swan, Anna	Vibrational and Electronic Aspects of Carbon Nanotubes and Their Interactions	NSF	9/1/2007	8/31/2010
Bellotti, Enrico	Sbir Phase II - New Sensing Capabilities For Situational Awareness	AFOSR/Photronics	3/20/2007	9/20/2009
Sergienko, Alexander Saleh, Bahaa	Phase-sensitive Quantum-optical Sensor	ARO	8/1/2007	9/10/2009
Starobinski, David Alanyali, Murat	Management of Secondary Markets in Deregulated Wireless Network	NSF	9/1/2007	8/31/2010
Trachtenberg, Ari Starobinski, David	A Theory Of Monitoring Based On Identifying Codes And Their Variants	NSF	10/1/2007	9/30/2010
Bellotti, Enrico	Simulation Models For IR FPAS	CSC/BAE Systems	9/1/2007	8/31/2009
Saleh, Bahaa Nawab, S. Hamid	Learning and Integrated View of Engineering	NSF	1/15/2008	12/31/2009
Morse, Theodore	Miniature Laser Therapy Endoscope	HHS/PHS/NIH/NIBIB via MGH	8/1/2007	7/31/2009
Morse, Theodore	Ultra-High Definition (1um) Digital X-Ray Imaging	MA Technology Transfer Center	5/1/2008	7/31/2009
Horenstein, Mark	Differential Stiffness Endoscope With Smart Articulated Joints	MA Technology Transfer Center	8/1/2008	8/31/2009
Cassandras, Christos Paschalidis, Ioannis	EFRI-ARESCI: Event-driven Sensing For Enterprise Reconfigurability And Optimization	NSF	11/1/2007	10/31/2011

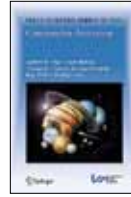
RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END
Paschalidis, Ioannis	Diagnosis And Assessment Of Faults, Misbehavior And Threats In Distributed Systems	NSF	9/15/2004	8/31/2009
Cassandras, Christos Castañón, David Paschalidis, Ioannis Baillieul, John	Sensors And Sensor Networks: A Control And Optimazation Science Base For Sensor Networks In Adverse And Stochastic Environments	NSF	9/1/2003	8/31/2009
Paschalidis, Ioannis	Final-stage Optimization Methods For Protein Docking Exploiting Energy Funnels	PHS/NIH/ NIGMS	1/15/2007	12/31/2009
Ünlü, M. Selim Swan, Anna	IRES: US-Turkey-Switzerland Collaboration on Resonant Structures for Biosensing and Imaging	NSF	5/1/2006	4/30/2010
Ruane, Michael Swan, Anna	REU Site: Research Experience For Undergraduates In Photonics	NSF	5/1/2008	10/31/2009
Starobinski, David	CAREER: Quality Of Service Engineering With Multiple Time-scale Traffic (REU)	NSF	5/1/2003	7/31/2009
Teich, Malvin	Quantum Optical Coherence Tomography (CenSSiS supplement)	NSF/Northeastern	2/1/2003	8/31/2009
Alanyali, Murat	CAREER: Scalable Architecture for	NSF	7/1/2003	9/30/2009
Ünlü, M. Selim Goldberg, Bennett	New Instrumentation for Nanoscale Subsurface Spectroscopy and Tomography	Univ of Rochester/DOD/Air Force	6/15/2003	9/30/2009
Oliver, William L.	Incoherent Scatter Radar Studies of Hot Oxygen	NSF	11/15/2003	10/31/2009
Oliver, William L.	REU Supplement: Incoherent Scatter Radar Studies of Hot Oxygen	NSF	11/15/2003	10/31/2009
Alanyali, Murat Saligrama, Venkatesh	Distributed Methods for Statistical Decision Making in Networked Environments	NSF	8/1/2004	7/31/2009
Starobinski, David	NeTS-NOSS: SensorNet Architecture for Indoor Location Detection:From Resolution to Robustness	NSF	9/1/2004	8/31/2009
Bellotti, Enrico	CAREER: Theoretical Investigation of Single Photon Detectors for Quantum Technology	NSF	5/1/2005	4/30/2010
Alanyali, Murat Saligrama, Venkatesh	Distributed Methods for statistical Decision Making in Networked environment (REU Supplement)	NSF	9/1/2002	7/31/2009
Starobinski, David Trachtenberg, Ari	REU Supplements: NetS-NOSS: SensorNet Architectures for Indoor Locations Detection: From Resolution to Robustness	NSF	8/31/2009	8/31/2009
Ishwar, Prakash	CAREER: Information-Scaling Laws, Bit-Conservation Principles, and Robust Coding Architectures in Sensor Networks	NSF	12/15/2005	11/30/2009
Ünlü, M. Selim	High-throughput, Label-free Promoter Sequence Discovery	PHS/NIH/ NIGMS	7/1/2006	6/30/2009
Paiella, Roberto Moustakas, Theodore	Intersubband All-Optical Switching and Optically-Pumped Light Emission with	NSF	9/1/2006	8/31/2010

Faculty Publications

Books



L. Miao and **C. G. CASSANDRAS**, *Energy-Latency Trade-offs in Real-Time Wireless Sensor Networks*, VDM Publishing, 2009.



A. F. Nagy, A. Balogh, T. E. Cravens, **M. MENDILLO**, and I. Müller-Wodarg (editors), *Comparative Aeronomy*, Space Science Series of the International Space Science Institute (ISSI), Bern, Switzerland, Springer, December 2008.



M. HORENSTEIN, *Design Concepts for Engineers*, 4th Edition, Prentice-Hall, 2009.



P. M. Kintner, A. J. Coster, T. Fuller-Rowell, A. J. Mannucci, **M. MENDILLO**, and R. Heelis (editors), *Midlatitude Ionospheric Dynamics and Disturbances*, Geophysical Monograph Series, No. 181, American Geophysical Union (AGU), Washington, DC, December 2008.



C. KARL and **A. HUBBARD**, *System Design using Current Mode Circuits: Challenges of analog signal processing in bioinspired systems: System concept, design and analysis*, VDM Verlag, 2008.



R. Lippmann, E. Kirdea, **A. TRACHTENBERG** (editors), *Recent Advances in Intrusion Detection*, Cambridge, MA, September 2008.

Book Chapters

R. Reif and **I. J. BIGIO**, "Elastic-scattering spectroscopy for optical biopsy: probe designs and analytical methods for clinical applications," in *Biomedical Applications of Light Scattering*, Backman, Wax (editors), McGraw-Hill, 2009.

L. DAL NEGRO, R. Li, J. Warga, S. Yerci, S. Basu, H. Hamel, G. Galli, "Light-emission from silicon-rich nitride nanostructures," in *Silicon Nanophotonics: Basic Principles, Present Status and Perspectives*, L. Khriachtchev (editor), Pan Stanford Publishing, 2008.

T. Van Court and **M.C. HERBORDT**, "Elements of High Performance Reconfigurable Computing," in *Advances in Computers*, Marvin Zelkowitz (editor); Elsevier, Inc 2009.

S. Lu, D. Mountain, and **A.E. HUBBARD**, "Is stereocilia velocity or displacement feedback used in the cochlear amplifier?" in *Concepts and Challenges in the Biophysics of Hearing*, World Scientific N. Cooper & D. Kemp (editors), February 2009.

A.E. HUBBARD, "Conjoined cochlear models: The TWAMP and the Sandwich" in *Concepts and Challenges in the Biophysics of Hearing*, World Scientific, N. Cooper & D. Kemp (editors), July 2008.

J. KONRAD, "Motion detection and estimation," in *The Essential Guide to Video Processing*, A. Bovik (editor), Academic Press, June 2009.

S. Ray, W. Lai, D. Guo, and **I. CH. PASCHALIDIS**, "Statistical Location Detection", in *Localization Algorithms and Strategies for Wireless Sensor Networks: Monitoring and Surveillance Techniques for Target Tracking*, G. Mao and B. Fidan (editors), IGI Global, 2009.

M. M. Laifenfeld, **A. TRACHTENBERG**, and **D. STAROBINSKI**, "Robust Localization using Identifying Codes," in *Localization Algorithms and Strategies for Wireless Sensor networks*, IGI Global, May 2009.

V. Venkataraman, D. Wang, A. Mahram, **W. QIN**, M. Bose, and J. Bhadra, "Synthesis Oriented Scheduling of Multiparty Rendezvous" in *Transaction Level Models*, May, 2009.

M. S. ÜNLÜ, A. Yalcin, M. Dogan, L. Moiseev, **A. K. SWAN**, B. B. Goldberg, and C. R. Cantor, "Applications of Optical Resonance to Biological Sensing and Imaging: I. Spectral Self-Interference Microscopy," *Biophotonics*, Springer 2008.

M. S. ÜNLÜ, I. E. Ozkumur, D. A. Bergstein, A. Yalcin, M. F. Ruane, and B. B. Goldberg, "Applications of Optical Resonance to Biological Sensing and Imaging: II. Resonant Cavity Biosensors," *Biophotonics*, Springer 2008.

Journal Articles

A. Yanik, X. Wang, S. Erramilli, M.K. Hong, and **H. ALTUG**, "Extraordinary Mid-infrared Transmission of Rectangular Coaxial Aperture," *Applied Physics Letters*, Vol 93, 2008.

D. Englund, **H. ALTUG**, B. Ellis, and J. Vuckovic, "Ultrafast Photonic Crystal Lasers," *Lasers and Photonics Review*, 2008.

A. Yanik, R. Adato, and **H. ALTUG**, "Design Principles for Optoelectronic Application of Extraordinary Light Transmission Effect in Plasmonic NanoAperture," *Journal of Nanoscience and nanotechnology*, June 2009.

D. D'Orsogna, S.P. Tobin and **E. BELLOTTI**, "Numerical Analysis of Very Long Wavelength HgCdTe Pixel Array for Infrared Detection," *Journal of Electronic Materials*, Vol. 37, No. 9, Sept. 2008

D. D'Orsogna, P. Lamarre, **E. BELLOTTI**, P.E. Barbone, F. Smith, C. Fulk, P. LoVecchio, M.B. Reine, S.P. Tobin, and J. Markunas, "A novel stress Characterization Technique for the Development of Low Stress Ohmic contacts to HgCdTe," *Journal of Electronic Materials*, 2009.

E. BELLOTTI, K. Driscoll, **T. D. MOUSTAKAS**, and **R. PAIELLA**, "Monte Carlo Simulation of Terahertz Quantum Cascade Laser Structures Based on Wide-Bandgap Semiconductors," *Journal of Applied Physics*, vol. 105, June 2009.

E. Furno, F. Bertazzi, M. Goano, G. Ghione and **E. BELLOTTI**, "Hydrodynamic transport parameters of wurtzite ZnO from analytic- and full-band Monte Carlo simulation," *Solid State Electronics*, Volume 52, Issue 11, November 2008.

F. Bertazzi, **E. BELLOTTI**, E. Furno, and M. Goano, "Experimental Electron Mobility in ZnO: A Reassessment Through Monte Carlo Simulation," *Journal of Electronic Materials*, 2009.

M. Penna, A. Marnetto, F. Bertazzi, **E. BELLOTTI** and M. Goano, "Empirical pseudopotential and full-Brillouin-zone k.p electronic structure of CdTe, HgTe and HgCdTe," *Journal of Electronic Materials*, 2009

P. Lamarre, C. Fulk, D. D'Orsogna, **E. BELLOTTI**, F. Smith, P. LoVecchio, M.B. Reine, T. Parodos, J. Marciniak, S.P. Tobin, and J. Markunas, "Characterization of Dislocations in HgCdTe Heteroepitaxial Layers Using a New Substrate Removal Technique," *Journal of Electronic Materials*, May 2009.

A. Marnetto, M. Penna, F. Bertazzi, **E. BELLOTTI** and M. Goano, "Ab initio, nonlocal pseudopotential, and full-zone k.p computation of the electronic structure of wurtzite BeO," *Optical and Quantum Electronics*, 2009.

J. Mao and **C.G. CASSANDRAS**, "Optimal Control of Multi-Stage Discrete Event Systems with Real-Time Constraints," *IEEE Transactions on Automatic Control*, Vol. 54, 1, 2009.

S. Zhuang, and **C.G. CASSANDRAS**, "Optimal Control of Discrete Event Systems with Weakly Hard Real-Time Constraints," *Journal of Discrete Event Dynamic Systems*, Vol. 19, 1, 2009.

D. CASTAÑÓN, "On CSS Publications," *IEEE Control Systems Magazine*, August 2008.

D. CASTAÑÓN, "The Legacy of George Axelby," *IEEE Control Systems Magazine*, October 2008.

F. CERRINA, A. Isoyan, F. Jiang, Y.-C. Cheng, Q. Leonard, J. Wallace, A. Ho, K. Henrich, M. Efremov, P. Nealey, "Extreme Ultraviolet Lithography: A Path to Nanopatterning," *Synchrotron Radiation News*, Volume 21, Pages 12 - 20, July 2008.

- M. R. Lockett, S. C. Weibel, M. F. Phillips, M. R. Shortreed, B. Sun, R. M. Corn, R. J. Hamers, **F. CERRINA**, and L. M. Smith, "Carbon-on-metal films for surface plasmon resonance detection of DNA arrays," *Journal of the American Chemical Society*, vol. 130, pp. 8611-+, July 2008.
- F. Jiang, Y. C. Cheng, A. Isoyan and **F. CERRINA**, "Engineering Study of Extreme Ultraviolet Interferometric Lithography", *J. Micro/Nanolith. MEMS MOEMS* 8(2), 021203-1(13), April 2009
- J. G. Lackey, D. Mitra, M. M. Somoza, **F. CERRINA**, and M. J. Damha, "Acetal Levulinyl Ester (ALE) Groups for 2'-Hydroxyl Protection of Ribonucleosides in the Synthesis of Oligoribonucleotides on Glass and Microarrays," *Journal of the American Chemical Society*, vol. 131, pp. 8496-8502, June 2009.
- S. Chen, M. F. Phillips, **F. CERRINA**, and L. M. Smith, "Controlling Oligonucleotide Surface Density in Light-Directed DNA Array Fabrication," *Langmuir*, vol. 25, pp. 6570-6575, June 2009.
- H. Perry, A. Gopinath, D. Kaplan, **L. DAL NEGRO**, F. Omenetto, "Nano and micro patterning of optically transparent mechanically robust, bio-compatible silk fibroin films," *Advanced Materials*, July 2008.
- S. Boriskina, A. Gopinath, and **L. DAL NEGRO**, "Optical gap formation and localization properties of optical modes in deterministic aperiodic photonic structures," *Optics Express*, 2008.
- S. Boriskina and **L. DAL NEGRO**, "Sensitive label-free biosensing using critical modes in aperiodic photonic structures," *Optics Express*, 2008.
- R. Li, J. Schneck, J. Warga, L. Ziegler, and **L. DAL NEGRO**, "Carrier Dynamics and Erbium sensitization in Silicon Rich Nitride," *Applied Physics Letters*, 2008.
- L. Sirleto, M.A. Ferrara, I. Rendina, J. Warga, R. Li, S.N. Basu, and **L. DAL NEGRO**, "Enhanced stimulated Raman scattering in silicon nanocrystals embedded in silicon-rich nitride/silicon superlattice structures," *Applied Physics Letters*, 93, 2008.
- J. Warga, R. Li, S.N. Basu, and **L. DAL NEGRO**, "Electroluminescence from Si-rich nitride/silicon superlattice structures," *Applied Physics Letters* 93, 2008.
- J. Warga, R. Li, S.N. Basu, and **L. DAL NEGRO**, "Erbium-doped silicon nanocrystals in silicon/silicon nitride superlattice structures: Light emission and energy transfer," *Physica E*, 41, 2009.
- L. DAL NEGRO**, G. Miano, G. Rubinacci, A. Tamburrino, and S. Ventre, "A fast computational method for the analysis of an array of metallic nanoparticles," *IEEE Transactions on Magnetics*, 45, March 2009.
- A. Gopinath, S. Boriskina, B. Reinhard, and **L. DAL NEGRO**, "Deterministic Aperiodic Arrays of Metal nanoparticles for surface-enhanced Raman scattering," *Optics Express*, 17, March 2009.
- C. Forestiere, G. Miano, G. Rubinacci, and **L. DAL NEGRO**, "Analysis of localized modes and spectral gaps in Fibonacci arrays of metal nanoparticles," *Physics Review B*, 79, 2009.
- C. Forestiere, G. Miano, S. Boriskina, and **L. DAL NEGRO**, "The role of nanoparticles shapes and deterministic aperiodicity for the design of nanoplasmonic arrays," *Optics Express*, 17, 2009.
- P. Contessa, A. Adam, and **C.J. DE LUCA**, "Motor unit control and force fluctuation during fatigue," *Journal of Neurophysiology*, April 23, 2009.
- M.C. HERBORDT**, Y. Gu, T. VanCourt, J. Model, B. Sukhwani, and M. Chiu, "Computing Models for FPGA-Based Accelerators with Case Studies in Molecular Modeling," *IEEE Computing in Science and Engineering*, 10 (6), 2008.
- Y. Wang and **P. ISHWAR**, "Distributed Field Estimation using Randomly Deployed, Noisy, Binary Sensors," *IEEE Transactions on Signal Processing*, volume 57, issue 3, March 2009.
- Y. Wang, **P. ISHWAR**, and **V. SALIGRAMA**, "One-bit Distributed Sensing and Coding for Field Estimation in Sensor Networks," *IEEE Transactions on Signal Processing*, volume 56, issue 9, September 2008.
- H. Dai and **R. KNEPPER**, "Differential Sensing of Substrate Noise in Mixed-Signal 0.18um BiCMOS Technology," *IEEE Electron Device Letters*, Vol. 29, No. 8, August 2008.
- R. Mathur, **R. KNEPPER**, and P.B. O'Connor, "A Low Noise, Broad-band Cryogenic preamplifier operated in a High Field Superconducting Magnet," *IEEE Transactions on Applied Superconductivity*, Sept. 2008.
- H Dai and **R.W. KNEPPER**, "Modeling and Experimental Measure-

- ment of Active Substrate Noise Suppression in Mixed Signal 0.18um BiCMOS Technology," *IEEE Trans on Computer-Aided Design of Integrated Circuits and Systems*, 2009.
- S. Ince and **J. KONRAD**, "Occlusion-aware optical flow estimation," *IEEE Transactions. Image Processing*, vol. 17, August 2008.
- S. Ince and **J. KONRAD**, "Occlusion-aware view interpolation," *EURASIP J. Image and Video Process.*, 2008.
- S. Laurent and **J. KONRAD**, "Vidéopsie et analyse 4D: la vidéo-surveillance du futur?." published by *L'Agence pour la Diffusion de l'Information Technologique* and by *Le Ministère des Affaires Étrangères et Européennes*, France, Sept. 2008 (in French).
- P.M. Jodoin, **J. KONRAD**, and **V. SALIGRAMA**, "Behavior subtraction, a new tool for video analytics," *SPIE Newsroom*, Apr. 2009.
- J. McHugh, **J. KONRAD**, **V. SALIGRAMA**, and P.M. Jodoin, "Foreground-adaptive background subtraction," *IEEE Signal Process. Lett.*, vol. 16, May 2009.
- L.M. Burton, J. A. Cohen, R. Pradipta, A. Labno, **M. C. LEE**, O. Batishchev, D. L. Rokusek, S. P. Kuo, B. J. Watkins, and S. Oyama, "Excitation and diagnosis of cascading Langmuir waves in ionospheric plasmas at Gakona, Alaska," *Phys. Scr.*, 2008.
- R. Pradipta, J. A. Cohen, **M. C. LEE**, A. Labno, L. M. Burton, R. J. Riddolls, O. V. Batishchev, A. J. Coster, W. J. Burke, M. J. Starks, M. P. Sulzer, and S. P. Kuo, "Space plasma disturbances caused by NAU-launched whistler waves," *Phys. Scr.*, 2008.
- Y. Rykalova, **L. B. LEVITIN**, and **R. BROWER**, "Multiprocessor networks with small buffers. Proc. of the 12th Communications and Networking Simulation Symposium," CNS 09, March 22 - 27, 2009, San Diego, CA., USA.
- M. Ali, Rama N. Reddy, and **M. K. MAZUMDER**, "Electrostatic charge effect on respirable aerosol particle deposition in a cadaver based throat cast replica," *Journal of Electrostatics*, Volume 66, Issues 7-8, July 2008.
- M. Ali, R. N. Reddy, and **M. K. MAZUMDER**, "Simultaneous characterization of aerodynamic size and electrostatic charge distributions of inhaled dry powder inhaler aerosols," *International Journal of Current Respiratory Medicine Review*, vol. 4, no. 1, August 2008.
- Y. Pu, **M.K. MAZUMDER**, and C.L. Charles, "Effects of electrostatic charging on pharmaceutical powder blending homogeneity," *J Pharm Sci.*, October 2008.
- R. Sharma, C. Wyatt, J. Zhang, C. Calle, N. Mardesich, and **M. K. MAZUMDER**, "Experimental evaluation and analysis of Electrodynamic Screen as dust mitigation technology for future Mars Missions," *IEEE Transactions on Industry Applications*, vol. 45, no. 2, March/April 2009.
- M. K. MAZUMDER**, **M. N. HORENSTEIN**, R. Sharma, A. S. Biris, and S. Trigwell, "Lunar and Martian Dust Dynamics: Electrostatic, Thermal and Gravitational Transport Mechanisms," *IEEE Industry Application magazine*, July 2009.
- R. Sharma, P. P. Das, V. Mahajan, J. Bock, S. Trigwell, A. S. Biris, **M. K. MAZUMDER**, M. Misra, "Enhancement of Photoelectrochemical Conversion Efficiency of Nanotubular TiO2 Photoanodes using Nitrogen Plasma Assisted Surface Modification," *Nanotechnology*, February 2009.
- M. Ali, **M.K. MAZUMDER**, and T. Martonen, "Measurements of electrodynamic effects on the deposition of MDI and DPI aerosols in a replica cast of human oral-pharyngeal-laryngeal airways," *Journal of Aerosol Medicine*, March 2009.
- O. Witasse, T. Cravens, **M. MENDILLO**, J. Moses, A. Kliore, A. F. Nagy, and T. Breus, "Solar system ionospheres," *Space Sci. Rev.*, vol. 139, July 2008.
- M. MENDILLO**, S. Smith, A. Coster, P. Erickson, J. Baumgardner, and C. Martinis, "Man-made space weather," *Space Weather*, vol. 6, September 2008.
- L. Moore, M. Galand, I. Mueller-Wodarg, R. Yelle, and **M. MENDILLO**, "Plasma temperatures in Saturn's ionosphere," *J. Geophys. Res.*, vol. 113, October 2008.
- P. Withers, **M. MENDILLO**, D. Hinson, and K. Cahoy, "Physical characteristics and occurrence rates of meteoric plasma layers detected in the martian ionosphere by the Mars Global Surveyor Radio Science Experiment," *J. Geophys. Res.*, vol. 113, Dec. 2008.
- S. Smith, J. Baumgardner, and **M. MENDILLO**, "Evidence of mesospheric gravity-waves generated by orographic forcing in the troposphere," *Geophys. Res. Lett.*, 36, April 2009.
- H. Rishbeth, **M. MENDILLO**, J. Wroten, and R. G. Roble, "Day-by-

day modeling of the ionospheric F2-layer for year 2002," *J. Atmos. Solar-Terr. Phys.*, 71, April 2009.

M. MENDILLO, "In Memoriam: Jules Aarons (1921-2008): Space Weather Pioneer," *Space Weather*, 14 May 2009.

A. Rosales-Garcia, **T. MORSE**, J. Hernandez-Cordero, and **M. S. ÜNLÜ**, "Single Polarization-Mode-Beating Frequency Fiber Laser," *IEEE Photonics Technology Letters*, Vol. 21, No. 8, April 2009.

T. D. MOUSTAKAS, T. Xu, C. Thomidis, A. Yu Nikiforov, L. Zhou and D. J. Smith, "Growth of III-Nitride quantum dots and their applications to blue-green LEDs," *Physica Status Solidi*, 205, No. 11, 2008.

L. Colakerol, L. F. J. Piper, A. Fedorov, T. C. Chen, **T. D. MOUSTAKAS**, and K. E. Smith, "Observation of an inverted band structure near the surface of InN," *Europhysics Letters (EPL)*, 83, 2008.

Y. Li, A. Bhattacharyya, C. Thomidis, Y. Liao, **T. D. MOUSTAKAS**, and **R. PAIELLA**, "Refractive-Index Nonlinearities of Intersubband Transitions in GaN/AlN Quantum-Well Waveguides," *J. Appl. Phys.*, vol. 104, October 2008.

J. Henson, A. Bhattacharyya, **T. D. MOUSTAKAS**, and **R. PAIELLA**, "Controlling the Recombination Rate of Semiconductor Active Layers via Coupling to Dispersion-Engineered Surface Plasmons," *J. Opt. Soc. Am. B*, vol. 25, July 2008.

S. Pookpanratana, R. France, M. Bar, L. Weihardt, O. Fuchs, M. Blum, W. Yang, J. D. Denlinger, **T. D. MOUSTAKAS** and C. Heske, "Intermixing and Chemical Structure at the interface between n-GaN and V-based contact," *Appl. Phys. Lett.* 93, 2008.

M. Misra, A. Bhattacharyya, and **T. D. MOUSTAKAS**, "UV Detectors," *Laser Focus World*, page 64, November 2008.

S. Riyopoulos and **T. D. MOUSTAKAS**, "Quantum wire behavior in wrinkled quantum wells deposited on textured GaN," *Gallium Nitride Materials and Devices IV*, Photonics West, January 2009.

K. Driscoll, Y. Liao, A. Bhattacharyya, L. Zhou, D. J. Smith, **T. D. MOUSTAKAS**, and **R. PAIELLA**, "Optically Pumped Intersubband Emission of Short-Wave Infrared Radiation with GaN/AlN Quantum Wells," *Appl. Phys. Lett.*, vol. 94, February 2009.

A. Bhattacharyya, **T. D. MOUSTAKAS**, Lin Zhou, David J. Smith and W. Hug, "Deep ultraviolet emitting AlGaIn quantum wells

with high internal quantum efficiency" *Appl. Phys. Lett.* 94, 181907 (2009).

H. NAWAB, R. Wotiz, and **C.J. DE LUCA**, "Decomposition of In-dwelling EMG Signals," *Journal of Applied Physiology*, Sept. 2008.

W. Oliver, S. Kawamura, and S. Fukao, "The Causes of Mid-Latitude F Layer Behavior" *J. Geophys. Res.*, 113, 2008.



Graduate student Erin Mclean demonstrating a flexible endoscope prototype

W. Lai and **I. CH. PASCHALIDIS**, "Optimally Balancing Energy Consumption versus Latency in Sensor Network Routing," *ACM Transactions on Sensor Networks*, Vol. 4, No. 4, August 2008.

Y. Shen, **I. CH. PASCHALIDIS**, P. Vakili, and S. Vajda, "Protein docking by the underestimation of free energy funnels in the space of encounter complexes," *PLoS Computational Biology*, Vol. 4, No. 10, October 2008.

D. A. Bergstein, I. E. Ozkumur, A. C. Wu, A. Yalcin, J. Needham, R. Irani, J. Gershoni, B. B. Goldberg, C. DeLisi, M. F. Ruane, and **M. S. ÜNLÜ**, "Resonant Cavity Imaging: A Means Toward High-Throughput Label-Free Protein Detection," *IEEE Journal of Selected Topics in Quantum Electronics*, Vol. 14, No. 1, Jan/Feb 2008.

N. Mohan, O. Minaeva, G. Goltsman, M. Nasr, **B. E.A. SALEH**, **A. SERGIENKO**, and **M. C. TEICH** "Photon-Counting Optical Coherence-Domain Reflectometry Using Superconducting Single-photon Detectors," *Optics Express*, v. 16, 2008.

M. B. Nasr, D. P. Goode, N. Nguyen, G. Rong, L. Yang, B. M. Reinhard, **B. E. A. SALEH**, and **M. C. TEICH**, "Quantum Optical Coher-

- ence Tomography of a Biological Sample," *Optical Communications*, 282, March 2009.
- O. Minaeva, C. Bonato, **B. E. A. SALEH**, and **A. SERGIENKO**, "Odd and Even-Order Dispersion Cancellation in Quantum Interferometry," *Physical Review Letters*, v. 102, 2009.
- M. F. Saleh, **B. E. A. SALEH**, and **M. C. TEICH**, "Modal, Spectral, and Polarization Entanglement in Guided-Wave Parametric Downconversion," *Phys. Rev. A*, June 2009.
- S. Aeron, M. Zhao, **V. SALIGRAMA**, "Fundamental limits to Sensing Capacity in Sensor Networks and Compressed Sensing," *IEEE Trans. on Information Theory*, 2008.
- A. Sahai, K. Woyach, G. Atia, and **V. SALIGRAMA**, "A technical perspective on light-handed regulation for cognitive radios," *IEEE Communications Magazine*, January 2009.
- M. Zettergren, **J. SEMETER**, P.L. Belly, G. Sivjee, I. Azeem, S. Mende, H. Gleisner, M. Diaz, and O. Witasse, "Optical estimation of auroral ion upflow: 2. A case study," *J. Geophys. Res.*, 113, July 2008.
- J. SEMETER**, M. Zettergren, M. Diaz, and S. Mende, "Wave dispersion and the discrete aurora: New constraints derived from high-speed imagery," *J. Geophys. Res.*, 113, 12, 2008, Dec. 2008.
- J. SEMETER**, T. Butler, C. Heinselman, M. Nicolls, J. Kelly, and D. Hampton, "Volumetric imaging of the auroral ionosphere: Initial results from PFISR," *J. Atmos. Sol. Terr. Phys.*, 71, January 2009.
- Jones, S. L., M. R. Lessard, P. A. Fernandes, D. Lummerzheim, **J. SEMETER**, C. J. Heinselman, K. A. Lynch, R. G. Michell, P. M. Kintner, H. C. Stenbaek-Nielsen, K. Asamura, "PFISR and ROPA observations of pulsating aurora," *J. Atmos. Sol. Terr. Phys.*, 71, January 2009.
- C. Bonato, **A. V. SERGIENKO**, **B. E. A. SALEH**, S. Bonora, and P. Villoresi, "Even-Order Aberration Cancellation in Quantum Interferometry," *Physical Review Letters*, v. 101, 2008.
- D. S. Simon, **A. V. SERGIENKO**, and T. B. Bahder, "Dispersion and Fidelity in Quantum Interferometry," *Physical Review A*, v. 78, 2008.
- M. Nasr, O. Minaeva, G. Goltsman, **A. SERGIENKO**, **B. SALEH**, and **M. C. TEICH**, "Submicron axial resolution in an ultrabroadband two-photon interferometer using superconducting single-photon detectors," *Optics Express*, v. 16, 2008.
- C. Bonato, D. S. Simon, P. Villoresi, and **A. V. SERGIENKO**, "Multi-parameter Entangled-State Engineering Using Adaptive Optics," *Physical Review A* v. 79, 2009.
- T. Wu and **D. STAROBINSKI**, "A Comparative Analysis of Server Selection in Content Replication Networks," *IEEE/ACM Transactions on Networking*, Vol. 16, No. 6, December 2008.
- A. Hagedorn, **D. STAROBINSKI**, **A. TRACHTENBERG**, "Rateless Deluge: Over-the-Air Programming of Wireless Sensor Networks Using Random Linear Codes," *Proc. of IEEE/ACM IPSN*, 2008.
- I. Stojanovic, Z. Wu, M. Sharif, and **D. STAROBINSKI**, "Data Dissemination in Wireless Broadcast Channels: Network Coding versus Cooperation," *IEEE Transactions on Wireless Communications*, Vol. 8, No. 4, April 2009.
- A. N. Vamivakas, D. Younger, B. B. Goldberg, **A. SWAN**, **M. S. ÜNLÜ**, E. R. Behringer, and S. B. Ippolito, "A case study for optics: The solid immersion microscope," *American Journal of Physics*, Vol. 76, 2008.
- A. G. Walsh, A. N. Vamivakas, W. Bacsá and **A. SWAN**, "Spectroscopic Properties Unique to Nano-Emitters," *Nano Letters*, Vol. 8, October 2008.
- M. Dogan, I. Aksun, **A. SWAN**, B. B. Goldberg, and **M. S. ÜNLÜ**, "Closed-form representations of field components of fluorescent emitters in layered media," *Journal of the Optical Society of America A*, Vol. 26, No. 6, June 2009.
- J. Cortadella and **A. TAUBIN**, Guest Editorial: "Special Section on Asynchronous Circuit and Systems," *IEEE Transactions on Very Large Scale Integration Systems*, Vol.17, No 6-7, June-July 2009.
- M. C. TEICH**, M. B. Nasr, S. Carrasco, **B. SALEH**, **A. V. SERGIENKO**, J. P. Torres, L. Torner, D. S. Hum, and M. M. Fejer, "Ultra-Broadband Biphotons Chirped QPM Down-conversion," *Optics and Photonics News*, p. 36 December 2008.
- M. Laifenfeld, **A. TRACHTENBERG**: "Identifying Codes and Covering Problems". *IEEE Transactions on Information Theory* 54(9): 3929-3950, 2008.

M. Laifenfeld, **A. TRACHTENBERG**, R. Cohen and **D. STAROBINSKI**, "Joint Monitoring and Routing in Wireless Sensor Networks Using Robust Identifying Codes," *Mobile Networks and Applications*, October 2008.

F. H. Koklu, A. N. Vamivakas, S. B. Ippolito, B. B. Goldberg, and **M. S. ÜNLÜ**, "Widefield Subsurface Microscopy of Integrated Circuits," *Optics & Photonics News*, December 2008, pp. 31

M. Ghioni, G. Armellini, P. Maccagnani, I. Rech, M. K. Emsley, and **M. S. ÜNLÜ**, "Resonant-cavity-enhanced single photon av-

lanche diodes on double silicon-on-insulator substrates," *Journal of Modern Optics*, Vol. 56, No. 2-3, January 2009.

F. H. Koklu, S. B. Ippolito, B. B. Goldberg, and **M. S. ÜNLÜ**, "Sub-surface microscopy of integrated circuits with angular spectrum and polarization control," *Optics Letters*, Vol. 34, 15 April 2009.

A. Yalcin, F. Damin, E. Ozkumur, G. di Carlo, B. B. Goldberg, M. Chiari, and **M. S. ÜNLÜ**, "Direct Observation of Conformation of a Polymeric Coating with Implications in Microarray Applications," *Analytical Chemistry*, Vol. 81, 2009.

Conference Papers

A. Al Daoud, **M. ALANYALI**, "On Secondary Spectrum Sharing in Narrowband Cellular Wireless Networks," *43rd Conference on Information Sciences and Systems*, March 2009.

A. Al Daoud, T. Alpcan, **M. ALANYALI**, S. K. Agarwal, "A Stackelberg Game for Pricing Uplink Power in Wide-Band Cognitive Radio Networks," *47th IEEE conference on Decision and Control*, December 2008.

A. A. Yanik, X. Wang, S. Erramilli, M.K. Hong, and **H. ALTUG**, "Polarization Control in MidIR wavelength range using Extraordinary Transmission Effects," *IEEE/LEOS Conference*, November 2008.

A. A. Yanik, X. Wang, S. Erramilli, M.K. Hong, and **H. ALTUG**, "Localized Plasmonic Control of Extraordinary Light Transmission in Rectangular Coaxial Aperture Arrays at Mid-IR," *SPIE/Photonics West Conference*, January 2009.

A. Marnetto, M. Penna, F. Bertazzi, **E. BELLOTTI** and M. Goano, "Ab initio and full-zone k.p computations of the electronic structure of wurtzite BeO," *NUSOD 08*, September 2008.

D. D'Orsogna, **E. BELLOTTI**, P. E. Barbone, P. Lamarre, F. Smith, C. Fulk, P. LoVecchio, M. Reine, S. Tobin, and J. Markunas, "Toward the Development of Low-Stress Ohmic Contacts for HgCdTe: A Novel Stress Characterization Technique," *Proceedings of the 2008 Workshop on the Physics and Chemistry of II-VI Materials*, Las Vegas, NV, November 11-13, 2008.

F. Bertazzi, E. Furno, M. Goano, and **E. BELLOTTI**, "Experimental Electron Mobility in ZnO: A Reassessment through Monte Carlo Simulation," *Proc. of the 2008 Workshop on the Physics and Chemistry of II-VI Materials*, Las Vegas, NV, November 11-13, 2008.

M. Penna, A. Marnetto, M. Goano, F. Bertazzi and **E. BELLOTTI**, "Ab initio, Semi-Empirical Pseudopotential, and Full- Zone k-p Electronic Structure of CdTe, HgTe, and Hg_{1-x}Cd_xTe," *Proceedings of the 2008 Workshop on the Physics and Chemistry of II-VI Materials*. November 11-13, 2008. Las Vegas, NV.

P. Lamarre, F. Smith, C. Fulk, P. LoVecchio, S. Tobin, M. Reine, T. Parodos, J. Marciniak, D. D'Orsogna, **E. BELLOTTI**, and J. Markunas, "Characterization of Dislocations in HgCdTe Epitaxial Layers Using a New Substrate Removal Technique," *Proceedings of the 2008 Workshop on the Physics and Chemistry of II-VI Materials*. November 11-13, 2008. Las Vegas, NV.

E. BELLOTTI, K. Driscoll, **T. D. MOUSTAKAS**, and **R. PAIELLA**, "Monte Carlo Study of the Temperature Dependent Performance of GaN versus GaAs Terahertz Quantum Cascade Structures," *IEEE Lasers and Electro-Optics Society Annual Meeting, paper TuO3*, Newport Beach, CA, November 2008.

E. BELLOTTI, N. Sucena Almeida, A. Moldawer, **T. D. MOUSTAKAS**, S. Chiaria, F. Bertazzi, E. Furno, M. Goano, and G. Ghione, "Physics-based design of III- Nitride and ZnO LEDs: from material properties to device optimization," *Proc. Of the 17th European Workshop on Heterostructure Technology (HETECH 2008)*, Edited by Gaudenzio Meneghesso, 2008.

T. Lee, E. Rodriguez, A. Bartoo, **I. J. BIGIO** and S. Singh, "Elastic Scattering Spectroscopy-Guided Forceps for Real-Time Detection of Dysplasia in Barrett's Esophagus," *Digestive Diseases Week*, San Diego, May 2009.

M. Austwick, J. Woodhams, C. Mosse, C. Elliot-Laize, V. Chalau, A. J. MacRobert, **I. J. BIGIO** and S. G. Bown, "Optical pharmaco-

- kinetics measures in-vivo drug concentration and compartmentalisation for AIS2Pc," *Proc. SPIE 7187*, p. 132, San Jose, 2009.
- C. Mulvey, C. Sherwood, **I. J. BIGIO**, "Wavelength-dependent backscattering measurements for quantitative real-time detection of apoptosis in living cells," *Proc. SPIE 7187*, p. 132, San Jose, Jan. 2009.
- J. Giedt, **R. BROWER**, S. Catterall, G. T. Fleming and P. Vranas, "Glucosylated condensates at the CCNI: 4096 CPUs weigh in," *proceedings for Workshop on Continuous Advances in QCD2008*.
- K. Barros, R. Babich, **R. BROWER**, M. A. Clark and C. Rebbi, "Blasting through lattice calculations using CUDA," *PoS (LATTICE 2008)*, 2008.
- J. Brannick, **R. BROWER**, M. Clark, S. F. McCormick, T. A. Man-teuffel, J. Osborn and C. Rebbi, "The removal of critical slowing down," *PoS(LATTICE 2008)*, 2008.
- R. Babich, **R. BROWER**, M. Clark, G. Fleming, J. Osborn, C. Rebbi, "Strange quark content of the nucleon" *PoS(LATTICE 2008)160*, 2008.
- S. M. Keene, and **J. CARRUTHERS**, "Loss Differentiation and Improved SNR Estimates at the Physical Layer in Wireless LANs," *4th IEEE Broadband Wireless Access Workshop*, New Orleans, Dec. 2008.
- J. Mao and **C. G. CASSANDRAS**, "Optimal Control of Multi-layer Discrete Event Systems with Real-Time Constraint Guarantees," *Proc. of 17th IFAC World Congress*, July 2008.
- M. Zhong and **C. G. CASSANDRAS**, "Distributed Coverage Control in Sensor Network Environments with Polygonal Obstacles," *Proc. of 17th IFAC World Congress*, July 2008.
- C. G. CASSANDRAS** and X. Ning, "Dynamic Sleep Time Control in Wireless Sensor Networks Using Traffic Statistics," *2008 INFORMS Annual Meeting*, Oct. 2008.
- C. G. CASSANDRAS**, A. Bestavros, **I. C. PASCHALIDIS**, R. Gao, and W. Gong, "Event-driven Sensing for Enterprise Reconfigurability and Optimization," *2008 INFORMS Annual Meeting*, Oct. 2008.
- M. Zhong and **C. G. CASSANDRAS**, "Asynchronous Distributed Optimization with Minimal Communication," *Proc. of 47th IEEE Conf. Decision and Control*, Dec. 2008.
- X. Ning, and **C. G. CASSANDRAS**, "Optimal Dynamic Sleep Time Control in Wireless Sensor Networks," *Proc. of 47th IEEE Conf. Decision and Control*, Dec. 2008.
- J. Mao, and **C. G. CASSANDRAS**, "On-line Optimal Control of a Class of Discrete Event Systems with Real-Time Constraints," *Proc. of 47th IEEE Conf. Decision and Control*, Dec. 2008.
- M. Zhong and **C. G. CASSANDRAS**, "Asynchronous Distributed Algorithms for Optimal Coverage Control with Sensor Networks," *Proc. of 17th IEEE Mediterranean Conference on Control and Automation*, June 2009.
- R. Gao, A. Deshmukh, W. Gong, J. Baillieux, **C. G. CASSANDRAS**, **D. CASTAÑÓN**, and **I. C. PASCHALIDIS**, "A Control and Optimization Science Base for Sensor Networks in Adverse and Stochastic Environments: Selected Advances of 2008," *Proc. of Civil, Mechanical and Manufacturing Innovation Grantees Conf.*, June 2009.
- D. CASTAÑÓN** and Darryl K. Ahner, "Team Task Allocation and Routing in Risky Environments under Human Guidance," *Proc. 2008 Conference on Decision and Control*, Cancun, Mexico, Dec. 2008.
- T. Wang, M. Quaglio, F. Pirri, Y.C. Cheng, D. Busacker and **F. CER-RINA**, "Patterning of SU-8 resist with digital micromirror device (DMD) maskless lithography," *Proc. SPIE*, Vol. 7274, 72742O, SPIE Advanced Microlithography Conference, March 2009.
- S. Chang, **C. J. DE LUCA**, and **S.H. NAWAB**, "Aliasing rejection in precision decomposition of EMG signals," *30th Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, Vancouver, Canada, August 2008.
- G. S. Meltzner, J. Sroka, J.T. Heaton, L.D. Gilmore, G. Colby, S.H. Roy, N. Chen, and **C. J. DE LUCA**, "Speech Recognition for Vocalized and Subvocal Modes of Production Using Surface EMG Signals from the Neck and Face," *Interspeech*, Brisbane, Australia, September 2008.
- G. Colby, J.T. Heaton, L.D. Gilmore, J. Sroka, Y. Bend, J. Cabrera, S.H. Roy, **C. J. DE LUCA**, and G.S. Meltzner, "Sensor Subset Selection for Surface Electromyography Based Speech Recognition," *International Conference on Acoustics, Speech, and Signal Processing*, Las Vegas, March - April 2009.
- C. J. DE LUCA**, S.S. Chang, S.H. and Nawab, "Decomposition of the Surface EMG Signal: accurate, automatic, and up to maximal

force," *International SFEMG Course and Xth Quantitative EMG Conference* Venice, Italy, May 6-10, 2009.

C. J. DE LUCA, and **S.H. NAWAB**, "Behavior of motor units revealed by decomposition of the EMG signal," *International Workshop and Conference on Human Reflexes*, Izmir, Turkey, May 2009.

C. J. DE LUCA, P. Contessa, and A. Adam, "Control properties of motor units during fatiguing contractions," *Int'l Workshop and Conference on Human Reflexe*, Izmir, Turkey, May 11-15, 2009.

M.C. HERBORDT, Y. Gu, T. VanCourt, J. Model, B. Sukhwani, M. Chiu, "Computing Models for FPGA-Based Accelerators," *Proc. of the Reconfigurable Systems Summer Institute*, July 2008.

B. Sukhwani and **M. C. HERBORDT**, "Acceleration of a Production Rigid Molecule Docking Code," *Field Programmable Logic and Applications*, pp. 341-346. September 2008.

T. Dean, J. Model, and **M. C. HERBORDT**, "Multicore versus FPGA in the Acceleration of Discrete Molecular Dynamics," *Proceedings of High Performance Embedded Computing*. September 2008.

M. Chiu, **M.C. HERBORDT**, M. Langhammer, "Performance Potential of Molecular Dynamics Simulations on High Performance Reconfigurable Computing Systems," *Proceedings of High Performance Reconfigurable Computing Technologies and Applications*, at Supercomputing 2008. November, 2008.

B. Sukhwani and **M.C. HERBORDT**, "GPU Acceleration of a Production Molecular Docking Code," *Proceedings of General Purpose Computation on GPUs*, at *ASPLOS 2009*. March 2009.

J. Park, and Y. Qiu, and **M.C. HERBORDT**, "CAAD BLASTP: NCBI BLASTP Accelerated with FPGA-Based Pre-Filtering," *Proceedings of the IEEE Symposium on Field Programmable Custom Computing Machines*, April, 2009.

A.E. HUBBARD, "Conjoined cochlear models: The TWAMP and the Sandwich," *Preliminary Manuscripts of the 10th International Workshop on the Mechanics of Hearing*, Keele, England, July 2008

A.E. HUBBARD, M. Nourzad, and **C. KARL**, "A real-time Biomimetic acoustic Sensors (BAMS)," Laurel, MD August 21-23, 2008.

A.E. HUBBARD, D. Anderson, C. Browning, H. Cohen, H. Fawcett, S. Kelsall, T. Gore, **C. KARL**, D. Mountain, M. Nourzad, L. Ziph-Schatzberg, G. Thoren, A. Zosuls, and S. Deligeorges, "Biomi-

metic Acoustic Direction Finding System," Laurel, MD August 21-23, 2008.

A.E. HUBBARD, S. Chiu, H. Cohen, D. Freedman, T. Gore, **C. KARL**, M. Nourzad, Y. Pu, A. Zosuls, and S. Deligeorges, "Miniaturization of Electronics for a (BAMS)," Laurel, MD August 21-23, 2008.

S. Lu, D. Mountain, and **A.E. HUBBARD**, "Is stereocilia velocity or displacement feedback used in the cochlear amplifier?" *Preliminary Manuscripts of the 10th International Workshop on the Mechanics of Hearing*, Keele, England, July 2008.

S. Kelsall and **A.E. HUBBARD**, "Enhancing the functionality of a biomimetic acoustic direction finding system with back-end algorithms," *J. Acoust. Soc. Am.*, Vol 124, No.4, Pt. 2. Miami, November 2008.

N. Ma and **P. ISHWAR**, "Two-terminal Distributed Source Coding with Alternating Messages for Function Computation," in the *Proceedings of the IEEE International Symposium on Information Theory (ISIT)*, Toronto, Canada, 6-11 July, 2008.

K. Kulikowski, **M. G. KARPOVSKY**, **A. TAUBIN**, and Z. Wang, "System-Level Concurrent Fault Detection for Secure QDI Asynchronous Circuits," *Proceedings of Workshop on Dependable and Secure Nanocomputing*, DSN-08, 2008.

K. Kulikowski, Z. Wang, and **M.G. KARPOVSKY**, "Comparative Analysis of Fault Attack Resistant Architectures for Private and Public Key Cryptosystems," *Proc of Int. Workshop on Fault-tolerant Cryptographic Devices*, 2008.

O.Keren, I. Levin, and **M. G. KARPOVSKY**, "Non-redundant Scheme for Arbitrary Error Detection in Combinational Circuits," *Proc. of 16th IFIP/IEEE Conf. on Very Large Scale Integration*, 2008.

S. Baranov, I. Levin, O. Keren, and **M.G. KARPOVSKY**, "Designing Fault Tolerant FSMs by Nano-PLAs," *Int. On-Line Testing Symp*, 2009.

Z. Wang, **M.G. KARPOVSKY**, and K. Kulikowski, "Replacing Linear Hamming Codes by Robust Nonlinear Codes Results in Reliability Improvement for Memories," *Int. Symp. Dependable Computing*, 2009.

Z.Wang, **M.G. KARPOVSKY**, and B. Sunar, "Multilinear Codes for Robust Error Detection," *Int. On-Line Testing Symp.*, 2009.

J. M. McHugh, **J. KONRAD**, **V. SALIGRAMA**, P.M. Jodoin and **D. CASTAÑÓN**, "Motion Detection with False Discovery Rate Control," *2008 Intl. Conf. on Image Processing*, San Diego, CA, 2008.

P.M. Jodoin, **J. KONRAD**, and **V. SALIGRAMA**, "Modeling background activity for behavior subtraction," in *ACM/IEEE Int. Conf. Distributed Smart Cameras*, Sep. 2008.

P.M. Jodoin, **J. KONRAD**, **V. SALIGRAMA**, and V. Veilleux-Gaboury, "Motion detection with an unstable camera," in *Proc. IEEE Int. Conf. Image Processing*, Oct. 2008.

P.R. KOTIUGA, "Near force-free magnetic fields, contact structures, open book decompositions, and Heegaard-Floer homology," *Special session on low-dimensional topology, 1042nd meeting of the AMS*, Wesleyan University, Middletown, CT. Oct.11-12, 2008.

P.R. KOTIUGA, "On the Topological Characterization of Force-free Magnetic Fields," *ACE '09- 5th Workshop on Advanced Computational Electromagnetics*, Accademia dei Lincei, Rome Italy January 12-14, 2009.

J.A. Cohen, L.M. Burton, R. Pradipta, A. Labno, **M.C. LEE**, S.P. Kuo, B.J. Watkins, and S. Oyama, "Ionospheric Ducts and Plasma Waves Induced by HF Heater over Gakona," *XXIX General Assembly of the Intl. Union of Radio Science*, Chicago, Aug. 7-16, 2008.

S.P. Kuo, and **M. C. LEE**, "Cascade of Langmuir Waves in HAARP Heating Experiments," *XXIX General Assembly of the Intl. Union of Radio Science*, Chicago, Aug. 7-16, 2008.

R. Pradipta, A. Labno, J.A. Cohen, L.M. Burton, **M.C. LEE**, W.J.

Burke, M.P. Sulzer, and S.P. Kuo, "Ionospheric Effects Caused by 40.75 kHz Whistler-mode Waves over Arecibo," *XXIX General Assembly of the Intl. Union of Radio Science*, Chicago, Aug. 7-16, 2008.

S.P. Kuo, M. Rubinraut, Y. L. Wu, R. Pradipta, J.A. Cohen, and **M.C. LEE**, "Frequency Dependence of VLF Wave Generation at Gakona, Alaska," *XXIX General Assembly of the Intl. Union of Radio Science*, Chicago, Aug. 7-16, 2008.

L. LEVITIN and **T. TOFFOLI**, "Orthogonalization time revisited," *The 9th Conf. on Quantum Structures*, Sopot, Poland, July 2008.

L. LEVITIN and **T. TOFFOLI**, "A generalized bound on the rate of quantum dynamics," *The 9th Intl. Conf. on Quantum Communication, Measurement and Computing*, Calgary, Canada, Aug. 2008.

Z. El-Jamous, **L.B. LEVITIN**, M. Mustafa, and **M. KARPOVSKY**, "Performance of cycle breaking algorithms for deadlock and livelock prevention in communication networks," *OPNETWORK 2008*, Washington, D.C., August 2008.

Z. El-Jamous, **L.B. LEVITIN**, and M. Mustafa, "Comparison of turn prohibition algorithms for deadlock prevention in interconnection networks," *IATED Conference on Communication Systems and Networks*, Palma de Mallorca, Spain, September 2008.

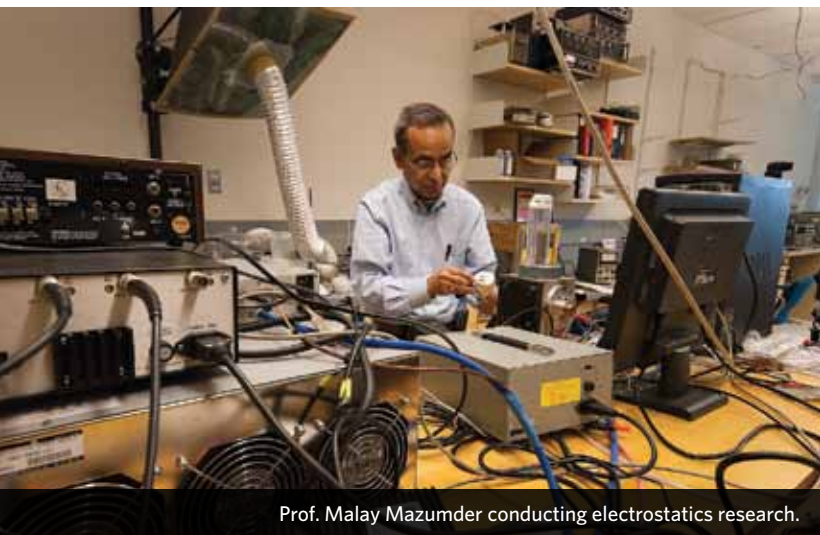
L. LEVITIN, **M. G. KARPOVSKY**, and M. Mustafa, "Deadlock prevention by Turn Prohibitions in Interconnection Networks," *Proc. of Int. Workshop on Communication Architecture for Clusters*, CAC, Rome, 2009.

L. B. LEVITIN, **M. KARPOVSKY**, and M. Mustafa, "Deadlock prevention by turn prohibition in interconnection networks," *IEEE IPDPS 2009*, May 25- 29, 2009.

K. Wang and **T.D.C. LITTLE**, "Dynamic Routing Selection for Wireless Sensor Networks," *Proc. 7th Intl. Symposium on Network Computing and Applications*, Cambridge, MA, July 2008.

S. Guo, C. Fan, and **T.D.C. LITTLE**, "Supporting Concurrent Task Deployment in Wireless Sensor Networks," *Proc. 7th Intl. Symposium on Network Computing and Applications*, Cambridge, MA, July 2008.

T.D.C. LITTLE, P. Dib, K. Shah, N. Barraford, and B. Gallagher, "Using LED Lighting for Ubiquitous Indoor Wireless Networking,"



Prof. Malay Mazumder conducting electrostatics research.

Proc. 4th IEEE Intl. Conf. on Wireless and Mobile Computing, Networking and Communications, Avignon, France, October 2008.

T.H. Kunz, J.C. Chau, Z. Wu, L. Hong, J. Reichard, M. Betke, and **T.D.C. LITTLE**, "Two Novel BatCams for Censusing Small Colonies of Bats," *38th Annual North American Symposium on Bat Research*, Scranton PA, October 2008.

A.S. Biris, Z. Li, Y. Xu, V. Saini, E. Dervishi, R. Sharma, S. Trigwell, F. Watanabe, **M. K. MAZUMDER**, A. R. Biris, and D. Lupu, "Multifunctional Coatings with Carbon Nanotubes for Electrostatic Charge Mitigation and Their Formation by Laser Heating," *IEEE Industry Applications Society 43rd Annual Meeting*, Edmonton, Canada, Oct., 2008.

R. Sharma, M. Misra, V. Mahajan, P. Das, J. Bock, A.S. Biris, and **M. K. MAZUMDER**, "Application of atmospheric-pressure plasma for enhancing photoelectrochemical properties of TiO₂ electrodes," *IEEE Industry Applications Society Annual meeting*, October, 2008.

M.K. MAZUMDER, R. Sharma, A.S. Biris, S. Trigwell, M.N. Horenstein, and M.M. Abbas, "Electrostatic and gravitational transport of lunar dust in the airless atmosphere of the moon," *IEEE Industry Applications Society Annual Meeting*, 2008.

M. K. MAZUMDER, R. Sharma, S. Banerjee, S. Mahapatra, I. Hidetaka, A. S. Biris, and M. Misra, "Interfacial Charge Transfer Process in Photoelectrochemical (PEC) Generation of Hydrogen using Layered Semiconductors as Photoanodes," *Materials Research Society Spring Meeting*, San Francisco, CA, March 2009 .

M.K. MAZUMDER, R. Sharma. and A.S. Biris, "Photoelectrochemical Production of Hydrogen," *DOE Annual merit Review Meeting*, Washington DC May 18 - 20, 2009.

M. Martinis, **M. MENDILLO** and J. Baumgardner, "Simultaneous Observations of Airglow Structures Related to ESF and MSTIDs at Arecibo," *COSPAR Meeting*, Montreal, July 13-20, 2008.

M. Matta, S. Smith, J. Baumgardner, C. Martinis, J. Wilson, and **M.MENDILLO**, "Observing the Moon's Sodium Tail," *COSPAR Meeting*, Montreal, Canada, July 13-20, 2008.

L. Moore, M. Galand, I. Mueller-Wodarg, R. Yelle and **M. MENDILLO**, "Plasma Temperature Calculations in Saturn's Ionosphere," *COSPAR Meeting*, Montreal, Canada, July 13-20, 2008.

I. Mueller-Wodarg, **M. MENDILLO**, L. Moore, M. Galand, and R. Yelle, "Progress in simulating and understanding the global structure and dynamics of Saturn's thermosphere and ionosphere," *COSPAR Meeting*, Montreal, Canada, July 13-20, 2008.

M. Paetzold, S. Tellmann, K. Peter, **M. MENDILLO**, P. Withers, B. Haeusler, D. Hinson, and L. Tyler, "The Structure of the Mars Ionosphere," *COSPAR Meeting*, Montreal, Canada, July 13-20, 2008.

Y. Sahai, F. Becker-Guedes, P. Fagundes, A. De Abreu, R. De Jesus, V. Pillat, C. Martinis, **M. MENDILLO**, C. Brunini, M. Gende, C. Huang, W. Lima, and J. Bittencourt, "Response of the Ionospheric F-Region in the South American Sector During the October 2003 Halloween Storms," *COSPAR Meeting*, Montreal, Canada, July 13-20, 2008.

C. Schmidt, J. Wilson, J. Baumgardner and **M. MENDILLO**, "Wide Field Observations of Mercury's Extended Sodium Exosphere," *COSPAR Meeting*, Montreal, Canada, July 13-20, 2008.

S. Smith, J. Baumgardner, C. Mertins, J. Russell III, M. Mlynczak and **M. MENDILLO**, "Ground-based Mesospheric OH Temperature Comparisons with Simultaneous TIMED SABER Temperatures over Millstone Hill," *COSPAR Meeting*, Montreal, Canada, July 13-20, 2008.

M. MENDILLO, S. Smith, J. Baumgardner, C. Martinis, A. Coster, and P. Erickson, "A Rocket exhaust depletion (RED) of ionospheric total electron content detected by GPS," *XXIX General Assembly of URSI*, Chicago, IL, August 2008.

M. MENDILLO, and C. Narvaez, "Ionospheric storms at a sub-auroral location in the southern hemisphere," *XXIX General Assembly of URSI*, Chicago, IL, August 2008.

L. Moore, M. Galand, I. Mueller-Wodarg, R. Yelle, and **M. MENDILLO**, "Plasma temperatures in Saturn's Ionosphere, Saturn After Cassini/Huygens Meeting," *Imperial College (UK)*, 28 July-1 August, 2008.

M. MENDILLO, M. Matta, S. Smith, J. Baumgardner, J. Wilson and C. Martinis, "Observing the Moon's exospheric tail with a ground-based all-sky camera," at *Future of Ground Based Solar System Research: Synergies with Space Probes and Space Telescopes*, Portoferraio, Isola d'Elba, Italy, 8-12 September 2008.

M. MENDILLO, "Report on the International Mercury Watch (IMW) program of ground-based multi-technique observations

in support of MESSENGER and BepiColombo missions to Mercury," at *Future of Ground Based Solar System Research: Synergies with Space Probes and Space Telescopes*, Portoferraio, Isola d'Elba, Italy, 8-12 September 2008.

M. Paetzold, S. Tellmann, **M. MENDILLO**, P. Withers, B. Haeusler, D. Hinson, and L. Tyler, "The structure of the Mars ionosphere," *European Planetary Science Congress*, Cologne, Germany, September 2008.

M. Matta, J. Baumgardner, J. Wilson, S. Smith, C. Martinis, and **M. MENDILLO**, "Observing the Moon's sodium tail," *Amer. Astron. Soc. Div. Planetary Sciences*, Ithaca, NY, October 2008.

C. Schmidt, C. J. Wilson, J. Baumgardner, and **M. MENDILLO**, "Wide field observations of variability in Mercury's comet-like sodium tail," *Amer. Astron. Soc. Div. Planetary Science*, Ithaca, NY, October 2008.

L. Moore, M. Galand, I. Mueller-Wodarg, and **M. MENDILLO**, "Modeling Saturn's ionosphere: Secondary Ionization and thermal balance," *Amer. Astron. Soc., Division of Planetary Science Meeting*, Ithaca, NY, October, 2008.

P. Withers, and **M. MENDILLO**, "Mars ionospheric research at Boston University," *Venus Express/Mars Express Radio Science Team Meeting*, Brussels, 15-16 November 2008.

M. MENDILLO, "No two ionospheric storms are the same....nonsense!," *Amer. Geophys. Union annual meeting*, San Francisco, December 2008.

C. Narvaez and **M. MENDILLO**, "Ionospheric storms at sub-auroral sites," *Amer. Geophys. Union annual meeting*, San Francisco, December 2008.

M. MENDILLO, R. Lombardi, M. Matta, C. Martinis, L. Moore and P. Withers, (Invited) "Comparative Aeronomy: Ionospheric Production for Terrestrial Planets, International Conference on Comparative Planetology: Venus-Earth-Mars," *European Space Agency*, ESTEC, Noordwijk, The Netherlands, 11-15 May 2009.

P. Withers, A. A. Christou, **M. MENDILLO**, M. Paetzold, K. Peter, S. Tellmann, and J. Vaubaillon, "Observations of the effects of meteors on the ionospheres of Venus, Earth and Mars," *Intl. Conference on Comparative Planetology: Venus-Earth-Mars*, *European Space Agency*, ESTEC, Noordwijk, Netherlands, 11-15 May 2009.

M. MENDILLO and A. Nagy (Invited) "Comparative Aeronomy: Earth and Saturn," *CEDAR Workshop*, Santa Fe, NM, June 2009.

T. D. MOUSTAKAS, "Materials Issues responsible for the 'green gap'," Roundtable Discussions of the Solid State Lighting R&D Task Structure, US DOE, Washington, DC, Sept. 17-18, 2008.

E. Dimakis, C. Thomidis, L. Zhou, D. J. Smith and **T.D. MOUSTAKAS**, "Investigation of the Emission Properties of InN / GaN Quantum Wells using Temperature Dependent Photoluminescence," *International Workshop on Nitride Semiconductors*, Montreux, Switzerland, October 2008.

J. Henson, A. Bhattacharyya, **T. D. MOUSTAKAS**, and **R. PAIELLA**, "Tunable Surface-Plasmon Resonances in Strongly Coupled Metallo-Dielectric Multiple Layers," *OSA Plasmonics and Metamaterials Topical Meeting*, Rochester NY, October 2008.

S. Nargelas, T. Malinauskas, A. Kadys, **T. D. MOUSTAKAS**, E. Dimakis, and K. Jarasiunas, "Nonlinear carrier recombination and transport features in highly excited InN layer," *Intl. Workshop on Nitride Semiconductors*, Montreux, Switzerland, October 2008.

T. D. MOUSTAKAS, "Fundamental Issues of UV Materials and Devices," ARL Workshop on Nitride Semiconductor Optoelectronics for Logistics in Energy, Health, and Safety. Arlington, VA, May 19th, 2009.

S.H. Roy, **S.H. NAWAB**, L.D. Gilmore, S.S. Chang, B.T. Cole, C. Thomas, M. Saint-Hillarie, J.F. Jabre, and **C.J. DE LUCA**, "Wearable-sensor system for monitoring motor function in Parkinson patients," *The Movement Disorder Society's 13th Intl. Congress of Parkinson's Disease and Movement Disorder*, Paris, June 7-11, 2009.

I. CH. PASCHALIDIS and S. C. Kang, "A Robust Approach to Markov Decision Problems with Uncertain Transition Probabilities," *Proceedings of the 17th IFAC World Congress*, Seoul, July 2008.

I. CH. PASCHALIDIS, S.C. Kang, and K. Li, "Distribution-Dependent Robust Linear Optimization with Asymmetric Uncertainty and Application to Optimal Control," *Proceedings of the 17th IFAC World Congress*, Seoul, July 2008.

I. CH. PASCHALIDIS, K. Li, and D. Guo, "Landmark-based position and movement detection of wireless sensor network devices," Invited, *Proceedings of 46th Annual Allerton Conference on Communication, Control, and Computing*, pages 7-14, Monticello, Illinois, September 23-26, 2008.

- I. CH. PASCHALIDIS** and D. Guo, "Localization in Sensor Nets: Adventures in Decision Theory and Facility Location," *INFORMS Annual Meeting*, Washington D.C., October 12-15, 2008.
- I. CH. PASCHALIDIS** and Y. Chen, "Anomaly Detection in Sensor Networks based on Large Deviations of Markov Chain Models", Invited, *Proceedings of the 47th IEEE Conference on Decision and Control*, Cancun, Mexico, December 2008.
- I. CH. PASCHALIDIS** and R. Wu, "On Robust Maximum Lifetime Routing in Wireless Sensor Networks," *47th IEEE Conference on Decision and Control*, Cancun, Mexico, December 2008.
- I. CH. PASCHALIDIS** and **C.G. CASSANDRAS**, "New Results on Distributed wireless sensor networks for long-term deployments," Invited, *DOE NNSA University and Industry Technical Interchange Review Meeting*, December 2 - 4, 2008, The Canyons, Utah.
- I. CH. PASCHALIDIS**, K. Li, R. Moazzez-Estanjini, Y. Lin, and D. Guo, "Intelligent forklift dispatching in warehouses using a sensor network," *Proc. of the 17th Mediterranean Conference on Control and Automation*, Thessaloniki, Greece, June 24-26, 2009.
- O. Minaeva, C. Bonato, **B. E. A. SALEH**, and **A. V. SERGIENKO**, "Odd- and Even-Order Dispersion Cancellation in Quantum Interferometry," *Frontiers in Optics 2008 OSA Annual Meeting*, Rochester, NY, October 19-24 2008.
- M. B. Nasr, D. P. Goode, N. Nguyen, G. Rong, L. Yang, B. M. Reinhard, **B. E. A. SALEH**, and **M. C. TEICH**, "Quantum Optical Coherence Tomography of a Biological Sample," *IEEE Lasers & Electro-Optics Society Annual Meeting*, Newport Beach, CA, Nov. 2008.
- E. Ermis, **V. SALIGRAMA**, P.M. Jodoin, and **J. KONRAD**, "Abnormal behavior detection and behavior matching for networked cameras," in *ACM/IEEE Int. Conf. Distributed Smart Cameras*, Sept. 2008.
- E. Ermis, **V. SALIGRAMA**, P.M. Jodoin, and **J. KONRAD**, "Motion segmentation and abnormal behavior detection via behavior clustering," in *Proc. IEEE Int. Conf. Image Processing*, Oct. 2008.
- Y. Benezeth, P. M. Jodoin, and **V. SALIGRAMA**, and C. Rosenberger, "Abnormal Events Detection Based on Spatio-Temporal Co-occurrences," in *IEEE Computer Society Conference on Computer Vision and Pattern Recognition(CVPR)*, Jun. 2009.
- J. SEMETER**, M. Diaz, M. Zettergren, A. Stromme, C. Heinselman, M. Nicolls, and J. Kelly, "Multi-scale radar and optical measurements of a substorm expansion," *AGU Fall Meeting Abstracts*, December 2008.
- J. SEMETER**, "Ground-based observations related to Alfvén wave dispersion," in *37th COSPAR Scientific Assembly, vol. 37 of COSPAR*, Plenary Meeting, 2008.
- M. Zettergren, **J. SEMETER**, C. Heinselman, M. Diaz, and P. Blelly, "ISR spectral analysis in regions of highly variable ion composition," *AGU Fall Meeting Abstracts*, December 2008.
- T. Butler, **J. SEMETER**, C. Heinselman, M. Nicolls, and J. Kelly, "Estimation of vector velocity field using an array of closely-spaced ISR measurements," *URSI National Radio Science Meeting*, January 2009.
- M. Oppenheim and **J. SEMETER**, "Particle-in-cell simulation of electron beam instabilities in the auroral ionosphere," *URSI National Radio Science Meeting*, January 2009.
- T. B. Bahder, D. S. Simon, and **A. V. SERGIENKO**, "Effect of Dispersion on Fidelity of Quantum Interferometer," *3rd Intl. Conf. of Quantum Information*, Boston, July 13-15 2008.
- A. SERGIENKO**, C. Bonato, **B. E. A. SALEH**, S. Bonora, and P. Villorosi, "Aberration Cancellation in Quantum Interferometry," *3rd Intl. Conf. of Quantum Information*, Boston, July 13-15 2008.
- C. Bonato, O. Minaeva, **A. SERGIENKO**, **B. E. A. SALEH**, S. Bonora, and P. Villorosi, "Spatial and Spectral Phase Control in Quantum Interferometry," *QCCQI 2008 Quantum/Classical Control in Quantum Information*, Otranto, Italy, September 13-20 2008.
- A. SERGIENKO**, "Entanglement in Quantum Communication: Dispersion Cancellation and Decoherence-Free Subspaces," *SECO-QC Quantum Network Demonstration Conf.*, Vienna, Oct. 2008.
- A. SERGIENKO**, O. Minaeva, C. Bonato, **B. E. A. SALEH**, and P. Villorosi "Dispersion Cancellation and Manipulation in Quantum Interferometry," *Frontiers in Optics 2008 OSA Annual Meeting*, Rochester, NY, October 19-24 2008.
- A. V. SERGIENKO**, O. Minaeva, D. Simon, **B. E. A. SALEH**, and C. Bonato, "Quantum Dispersion Cancellation in Frequency and in Space," *CLEO/Europe-IQEC, 19th International Congress on Photonics in Europe*, Munich, Germany, June 14-19, 2009.
- O. Minaeva, A. Divochiy, A. Korneev, **A. V. SERGIENKO**, and G. N.

Goltsman, "Number Resolving Superconducting Single-Photon High Speed Infrared Photon Counting with Photon Detectors (SSPDs)," *CLEO/Europe-IQEC, 19th International Congress on Photonics in Europe*, Munich, Germany, June 14-19, (2009).

A. Hagedorn, S. Agarwal, **D. STAROBINSKI**, and **A. TRACHTENBERG**, "Rateless Coding with Feedback," *IEEE INFOCOM 2009*, Rio De Janeiro, Brazil, April 2009.

W. Xiao and **D. STAROBINSKI**, "Extreme Value FEC for Wireless Data Broadcasting," *IEEE INFOCOM 2009*, Rio De Janeiro, Brazil, April 2009.

A. Aziz, **D. STAROBINSKI**, and P. Thiran, "Elucidating the Instability of Random Access Wireless Mesh Networks," *IEEE SECON 2009*, Rome, Italy, June 2009.

A.G. Walsh, J. Schneck, A. Green, M. Hersam, L. Ziegler, **A.K. SWAN** "Exciton dynamics in (6,5) carbon nanotubes," *Optical Society of America Annual conference, Frontiers in optics*, Rochester NY, Oct 2008

A. Yalcin, F. Damin, E. Ozkumur, M. Dogan, M. Chiari, **A. K. SWAN**, B. B. Goldberg, and M. S. Ünlü, "Nanoscale Determination of Molecular Conformation on Surfaces," *Gordon CenSSIS Research and Industry Collaboration Conference*, October 2008.

A. Krause and **A.K. SWAN**, "Using Dark Field Microscopy to Probe Subsurface Structures Compositions by utilizing Dipole Fields from an Ideal Point Source," *Gordon CenSSIS Research and Industry Collaboration Conference*, October 2008.

B. B. Goldberg, S. Rémi, C. Metzger, W. Hubbard, and **A. K. SWAN**, "Dissipation Mechanisms in Free Standing Single and Bilayer Graphene," *Optical Society of America- Annual conference, Frontiers in optics*, Rochester NY, October 2008.

A.G.Walsh, J. Schneck, A. Green, M. Hersam, S. Redner, L. Ziegler, and **A.K. SWAN**, "Exciton Dynamics in (6,5) carbon nanotubes," *American Physical Society Meeting*, Pittsburg, US, March 2009.

C. Metzger S. Remi, S. Kusminskiy, A. Castro Neto, **A.K. SWAN**, and B.B. Goldberg, " Strain and adhesion of graphene sheets in shallow trenches," *American Physical Society Meeting*, Pittsburgh, PA, March 2009.

M. Harrah, M. El Batanouny, and **A.K. SWAN**, "Isotropic and

Anisotropic Strain Dependence of Raman Modes in Graphene" *American Physical Society Meeting*, Pittsburg, PA, March 2009.

S. Remi, C. Metzger, **A.K. SWAN**, and B.B. Goldberg, "Micro Raman spectroscopy of graphene Hall Bars in the QHE regime" *American Physical Society Meeting*, Pittsburg, PA, March 2009.

A. Smirnov and **A. TAUBIN**, "Heuristic based throughput analysis and optimization of asynchronous pipelines," *Proc. 15th IEEE International Symposium on Advanced Research in Asynchronous Circuits and Systems*, May 2009 .

N. Mohan and **M. C. TEICH**, "Ultra-Broadband Optical Coherence Tomography Using Parametric Downconversion and Superconducting Single-Photon Detectors at 1064 nm," Invited Poster, *NSF Site Visit, The Bernard M. Gordon Center for Subsurface Sensing and Imaging Systems*, Boston, Massachusetts, April 2009.

M. S. ÜNLÜ, I. E. Ozkumur, J. Needham, D. A. Bergstein, B. B. Goldberg, A. Yalcin, P. S. Spuhler, R. Irani, and C. DeLisi, "Applications of Optical Resonance to Biological Imaging and Label-free Protein Microarrays," *EMBC08*, Vancouver, August 20-24, 2008.

M. Dogan, **M. S. ÜNLÜ**, B. B. Goldberg, and **A. K. SWAN**, "Fluorescence localization on Bacterial surfaces," *Gordon CenSSIS Research and Industry Collaboration Conference*, October 2008.

A. Yalcin, F. Damin, E. Ozkumur, G. di Carlo, B. B. Goldberg, M. Chiari, and **M. S. ÜNLÜ**, "Nanoscale Determination of Conformation of a Polymeric Coating on Layered Surfaces," *AVS 55th International Symposium and Exhibition*, October 2008.

F. H. Koklu, A. N. Vamivakas, B. B. Goldberg, and **M. S. ÜNLÜ**, "Tailoring the Local Environment of Quantum Dots for Enhanced Collection Efficiency," *Proceedings of IEEE Lasers and Electro-Optics Society 2008 Annual Meeting*, November 9, 2008,

F. H. Koklu, S. B. Ippolito, J. I. Quesnel, B. B. Goldberg, and **M. S. ÜNLÜ**, "Subsurface Microscopy of Integrated Circuits with Apodization and Polarization Control," *Proceedings of IEEE Lasers and Electro- Optics Society 2008 Annual Meeting*, November 9, 2008.

A. Yalcin, E. Ozkumur, B. B. Goldberg, and **M. S. ÜNLÜ**, "High lateral resolution spectral self-interference fluorescence microscopy using annular apertures," *Photonics West 2009 - BIOS*, January 2009.

E. Ozkumur, A. Yalcin, F. Damin, B. B. Goldberg, M. Chiari, and **M.**

S. ÜNLÜ, "Label-free and dynamic measurement of biomolecular interactions for high-throughput diagnostics," *Photonics West 2009 - BIOS*, January 2009.

A. Yalçin, F. Damin, E. Ozkumur, G. di Carlo, L. Sola, **M. S. ÜNLÜ**, and M. Chiari, "Nanoscale Determination of a Polymeric Coating for Microarray Applications," *23rd International Symposium on MicroScale Bioseparations (MSB) 2009*, February 2009.

Invited Lectures

M. ALANYALI, "A Queuing Analysis of Opportunistic Transmission in the Downlink," Coordinated Science Laboratory, University of Illinois at Urbana-Champaign, February 2009.

M. ALANYALI, "Network coexistence in emerging models of uncensored spectrum access," Bilkent University, March 2009.

M. ALANYALI, "On fair coexistence of wireless networks via CSMA based transmission algorithms," The Hamilton Institute, Maynooth Ireland, June 25, 2009

H. ALTUG, "Nanoplasmonics for bio-sensing," MIT's Advanced Nanofabrication Seminar Series, Cambridge, MA Nov. 2008.

H. ALTUG, "Advances in Nanophotonics and Plasmonics," Invited Short Course, Boston University, Photonics Center's Future of Light Symposium, Boston, MA, December 2008.

H. ALTUG, "Nanophotonics for bio-sensing applications," UMass Lowell, Physics Dept. Seminar Series, Lowell, MA March 2009.

E. BELLOTTI, N. Sucena Almeida, A. Moldawer, **T. D. MOUSTAKAS**, S. Chiaria, F. Bertazzi, E. Furno, M. Goano, and G. Ghione, "Physics-based design of III-Nitride and ZnO LEDs: from material properties to device optimization," 17th European Workshop on Heterostructure Technology, Venice, Italy, Nov. 3-5, 2008.

C. Mulvey, C. Sherwood, and **I. J. BIGIO**. Gordon Conference on Optics in Medicine and Biology, "Wavelength-dependent back-scattering measurements for quantitative real-time detection of apoptosis in living cells," July, 2008.

I. J. BIGIO, Woods Hole Symposium on Neuroprotective Agents, "Optical Pharmacokinetics: noninvasive, site-specific measurement of drug concentrations in tissue," Sept. 2008.

A. Yalçin, **M. S. ÜNLÜ**, and **A.K. SWAN**, "Detection of Molecular Conformations and Orientations on Surface via Self-Interference Fluorescence Microscopy," *National Science Foundation Review, CenSSIS*, April 2009.

I. J. BIGIO, NCI Translational Science Meeting, Bethesda, "Clinical translation of diagnostics based on optical scattering spectroscopy: what really matters for clinical applications?" Oct. 2008.

I. J. BIGIO, Colloquium, Duke University, Fitzpatrick Photonics Institute, "Elastic light scattering spectroscopy for the detection of pre-cancer," Nov. 2008.

I. J. BIGIO, OSA Traveling Lecturer: University of Michigan, "Elastic light scattering spectroscopy for the detection of pre-cancer," March 2009.

I. J. BIGIO, Plenary Lecture, Int'l Soc. for Head and Neck Optical Diagnostics, London, "Elastic light scattering spectroscopy for the detection of pre-cancer: an overview," March, 2009.

I. J. BIGIO, OSA Traveling Lecturer: University of Arizona, College of Optical Sciences, "Elastic light scattering spectroscopy for the detection of pre-cancer," April 2009.

R. BROWER, "Moebius Algorithms for Domain Wall and GapDW Fermions," at the 26th International Symposium On Lattice Field Theory (Lattice 2008) Williamsburg, Virginia, 14-20 Jul 2008.

R. BROWER, "Disconnected Diagrams, Multi-grid, Nvidia and all that," at The Fifth International Workshop on Numerical Analysis and Lattice QCD Regensburg, September 3-6, 2008.

R. BROWER, "Scaling, SciDAC API and Multigrid vs multi-core -- search for a new paradigm," Pathways to Blue Waters: Communication Intensive Algorithms and Applications October 15-17, 2008 NCSA, Urbana, Illinois.

R. BROWER, "Multigrid in the Chiral limit" and "Lattice Chiral

Gauge Theory," at DOE Extreme scale Computing Workshop, Quantum Universe at Stanford, Calif Dec 9-11, 2008.

C.G. CASSANDRAS "How much Communication to Achieve Optimal Cooperation?" The MathWorks Inc, Beijing, July 2008.

C.G. CASSANDRAS, "A New "Best Rank" Approach for Solving a Class of Stochastic Optimization Problems in Real Time," Center for Intelligent Networked Systems, Tsinghua University, Beijing, July 2008.

C.G. CASSANDRAS, "Joys and Perils of Automation," Workshop on Systems and Control for High School Students, Seoul, July 2008.

C.G. CASSANDRAS, "Optimal Dynamic Sleep Time Control in Sensor Networks," DOE Grantee Meeting, Salt Lake City, UT, December 2008.

D. CASTAÑÓN, "Team Task Allocation under Human Guidance," AFOSR, Arlington, VA August 2008.

A. Bangla and **D. CASTAÑÓN**, "Distributed Coding and Classification using Compressed Sensing," Proc. Workshop on Frontiers in Distributed Communication, Sensing and Control, Yale University, Nov. 2008.

D. CASTAÑÓN, "Sensor management for integrated surveillance," Ohio State, Columbus, OH, November, 2008.

D. CASTAÑÓN, "Team Task Allocation," AFOSR, Arlington, VA December 2008.

F. CERRINA, "Patterning at the Nanoscale: From Silicon to DNA," Innovation Alberta, Edmonton, 2008.

F. CERRINA, "Nanopatterning: From Silicon to DNA," University of Rome, La Sapienza, 2008.

F. CERRINA, "Patterning at the Nanoscale: From Silicon to DNA," Lincoln Lab, Lexington, 2009.

F. CERRINA, "Patterning at the Nanoscale: From Silicon to DNA," NSLS, Brookhaven National Laboratory, Upton, 2009.

F. CERRINA, "Patterning at the Nanoscale: From Silicon to DNA," IPNRA - OSA, Honolulu, 2009.

F. CERRINA, "Lithography and DNA," Frontiers of Nanoscience, Salt Lake City, 2009.

L. DAL NEGRO, "Erbium-coupled silicon nanocrystals in silicon nitride: light emission enhancement in aperiodic photonic structures," PRIME, Electrochemical Soc. Meeting, Honolulu, 2008.

L. DAL NEGRO, "Light in Deterministic Aperiodic Structures," Boston University, Symposium of Light, Dec. 7, Boston, 2008.

L. DAL NEGRO, "Light in Deterministic Aperiodic Structures," Yale University, New Haven, CT, December 17, 2008.

L. DAL NEGRO, "Deterministic Aperiodic Photonic-plasmonic structures," Intl. Workshop on Advanced Computational Electromagnetics, Lincei Academy, Rome, Italy, January 12-14, 2009.

L. DAL NEGRO, "Light in Deterministic Aperiodic Nanostructures," Photonics West Meeting, San Jose, CA, Jan. 24-29, 2009.

L. DAL NEGRO, "PL and EL from silicon-rich nitride films and multilayer structures," Photonics West Meeting, San Jose, CA, Jan. 24-29, 2009.

L. DAL NEGRO, "Light in aperiodic materials", New York University, May 4, 2009.

L. DAL NEGRO, "Light emission from silicon nanostructures: past, present and future perspectives," CLEO/IQEC Conference, Baltimore, MD, May 31 - June 5, 2009.

L. DAL NEGRO, "Design and engineering of on-chip localized fields with deterministic aperiodic structures," MRS Spring Meeting, April 13-17 2009, San Francisco.

L. DAL NEGRO, "Deterministic aperiodic structures for nanophotonics and sensing applications," EPFL, Lousanne, Switzerland, June 10, 2009.

L. DAL NEGRO, "Light scattering and trapping in aperiodic deterministic environments," 5th Workshop on numerical methods for optical nanostructures, ETH, Zurich, June 6-7, 2009.

L. DAL NEGRO, "Light in aperiodic structures," IEEE - ICTON Azorres, June 28-July 02, 2009.

C.J. DE LUCA, "Clinical Applications of sEMG, American Asso-

ciation of Neuromuscular & Electrodiagnostic Medicine," Providence, RI, September 18, 2008.

C.J. DE LUCA, "Decomposition of the Surface EMG Signal: accurate, automatic, and up to maximal force," International SFEMG Course and Xth Quantitative EMG Conference, May 9, 2009.

C.J. DE LUCA, Invited Speaker, "Control properties of motor units during fatiguing contractions," International Workshop and Conference on Human Reflexes. Izmir, Turkey, May 11, 2009.

C.J. DE LUCA, Invited Speaker, "Behavior of motor units revealed by decomposition of the EMG signal," International Workshop and Conference on Human Reflexes. Izmir, Turkey, May 14, 2009.

ROSCOE GILES, chaired Session and presented in a panel at the SuperComputing 2008 conference, November 15-22, 2008.

M. HERBORDT, "Opportunities in Design Automation for FPGA-Based Computation," Mentor Graphics; Portland, OR, March 11, 2009.

M. HERBORDT, "Elements of High Performance Reconfigurable Computing with Applications in Bioinformatics and Computational Biology," Keynote Talk; Many-Core and Reconfigurable Supercomputing Conference; Berlin, Germany, March 24, 2009.

M. HERBORDT, "High Performance Computing Using FPGAs: Promise and Current Work," ECE Department; Worcester Polytechnic Institute; Worcester, MA, February 26, 2009.

P. ISHWAR, "Distributed Coding for Interactive Computing," NSF Workshop on the Frontiers in Distributed Comm., Sensing and Control, Yale University, New Haven, CT, Oct 31-Nov 2, 2008.

P. ISHWAR, "Distributed Source Coding for Interactive Function Computation," RLE Signal Transformation and Information Representation Seminar Series, MIT: 1 December, 2008.

P. ISHWAR, "Distributed Source Coding for Interactive Function Computation," EE Seminar Series of the Division of Engineering and Applied Sciences, Harvard University, 13 February, 2009.

P. ISHWAR, "Bounds for Interactive Computation in Collocated Networks," 4th IEEE Intl. Workshop on Info. Theory and its Applications, University of California, San Diego, 8-13 February, 2009.

P. ISHWAR, "Interactive Function Computation: A Distributed

Block Source Coding Perspective," Topics in Systems Seminar Series, University of Illinois, Urbana-Champaign Coordinated Science Laboratory, 10 March, 2009.



Prof. Anna Swan (right) discussing a rail gun project with a student

P. ISHWAR, "Interactive Function Computation: A Distributed Block Source Coding Perspective," ECE Dept. Systems Seminar Series, University of Wisconsin, Madison, 12 March, 2009.

M.G. KARPOVSKY, "New Identifying codes Ecole National Supérieure," Paris, France, July 2008.

M.G. KARPOVSKY, "Robust codes for secure hardware," Worcester Polytechnic Inst, Worcester MA, January 2009.

M.G. KARPOVSKY, "Codes for detection of fault injection attacks on cryptographic hardware," Worcester Polytechnic, Institute, Worcester, MA, March, 2009.

P.R. KOTIUGA, "Near force-free magnetic fields, contact structures, open book decompositions, and Heegaard-Floer homology," UC Berkeley Math. Dept. Sept. 28th, 2008.

L.B. LEVITIN, "Information Theory and Applications," (cycle of 10 lectures) Max Planck Institute, Berlin, July-August 2008.

M. MENDILLO, "Some Pivotal Questions Facing Equatorial and Mid-Latitude Aeronomy," COSPAR Meeting, Montreal, Canada, July 13-20, 2008.

M. MENDILLO, H. Rishbeth, R. Roble, J. Wroten, B. Foster, "Assessing the TIME-GCM With Coupling from Below," COSPAR Meeting, Montreal, Canada, July 13-20, 2008.

- T. MORSE**, A. Rosales-Garcia, and J. Hernandez-Cordero, "Polarization Mode Beating (PMB) as an ultra-sensitive fiber optic sensor," in Wuhan, China, 2008.
- T. D. MOUSTAKAS**, "GaN-based Light Emitting Diodes for Solid State Lighting and UV Applications," New England Chinese Info. and Networking Association, Waltham, MA, Dec. 10, 2008.
- I. CH. PASCHALIDIS**, "A New Statistical Localization Framework for Wireless Sensor Networks," Dept. of Electrical and Computer Engineering, The Ohio State University, May 29, 2009.
- I. CH. PASCHALIDIS**, "Mathematics of Statistical Localization in Wireless Sensor Networks and Related Problems," Department of Mathematics, University of Athens, Greece, June 16, 2009.
- W. QIN**, "Rendezvous Finite State Machine - Where TLM meets RTL, Freescale Semiconductors," Herzliya, IL, July 3, 2008.
- W. QIN**, "Rendezvous Finite State Machine—Formalism for High Level Design Workshop on High-Level Hardware Modeling for Verification," Princeton University, Princeton, NJ, July 14, 2008.
- W. QIN**, "Lyra: A Concurrent Model to Bridge Transaction Level Modeling and RTL Implementation," University of Rhode Island, Kingston, RI, Feb 25, 2009 .
- W. QIN**, "Lyra: A Concurrent Model to Bridge Transaction Level Modeling and RTL Implementation," University of Massachusetts, Amherst, MA, Mar 27, 2009.
- W. QIN**, "Lyra: A Concurrent Model to Bridge Transaction Level Modeling and RTL Implementation," University of Connecticut, Storrs, CT, Apr 3, 2009.
- V. SALIGRAMA**, "Codes to Unmask Spectrum Violators in Cognitive Radio Systems," Asilomar, 2008.
- V. SALIGRAMA**, "Crime and Punishment for Cognitive Radios," Allerton, Sep. 2008.
- V. SALIGRAMA**, "Distributed Statistical Methods in Networked Video Surveillance," Allerton, 2008.
- V. SALIGRAMA**, "Video Analytics over Camera Networks, In-Q-Tel (A CIA Venture Arm)," Nov. 2008.
- V. SALIGRAMA**, "Video Analytics over Multi-Camera Networks," BU Computer Science Colloquium, Dec. 2008.
- V. SALIGRAMA**, "Compressed Sensing Workshop Noisy Group Testing and Boolean Compressed Sensing," Duke University, Feb. 2009.
- V. SALIGRAMA**, "Video Analytics over Multi-Camera Networks," MITRE Corp., Feb. 2009.
- V. SALIGRAMA**, "Information Theory and Applications Workshop "Noisy Group Testing and Boolean Compressed Sensing," University of California, San Diego, Feb. 2009.
- V. SALIGRAMA**, "Department of Computer Science Video Analytics over Multi-Camera Networks," University of Maryland, College Park, March 2009.
- V. SALIGRAMA**, Panelist, "Towards a Comprehensive Counter IED Program: Video Analytics," Department of Homeland Security University Network Summit, Washington, DC, March, 2009.
- V. SALIGRAMA**, "Statistical Anomaly Detection in Video Surveillance," Gordon-CenSSIS Research and Industrial Collaboration Conference, Boston, MA, October 2008.
- V. SALIGRAMA**, "Video Analytics over Multi-Camera Networks," Lab. for Information and Decision Systems, MIT, April 2009.
- J. SEMETER**, "Ground-based observations related to Alfvén wave dispersion," 37th COSPAR Scientific Assembly, Montreal, July 2008.
- J. SEMETER**, "Structure and Motion in the Aurora," University of Minnesota Astronomy Department Colloquium, October 2008.
- A. V. SERGIENKO**, "Principles and Applications of Quantum Dispersion Cancellation with Entangled Photons," Quantum Entanglement Workshop IEEE Photonics Society, Boston Chapter, MIT Lincoln Lab, Lexington, MA, April 22, 2009.
- A. V. SERGIENKO**, "Quantum Communication and Measurement with Non-classical Light," Dept. of Electrical Engineering and Dept. of Applied Physics, Yale University, New Haven, Connecticut, May 6, 2009.
- A. V. SERGIENKO**, "Quantum Communication and Measurement with Non-classical Light," Joint Colloquium Department of Phys-

ics and Fondazione Bruno Kessler, University of Trento, Trento, Italy May 21, 2009.

A. V. SERGIENKO, "Quantum Measurement with Non-classical Light," Physics Department, Scuola Normale Superiore, Pisa, Italy, June 24, 2009.

A. Krause, and **A.K. SWAN**, "Using Dark Field Microscopy to Probe Subsurface Structures Compositions by utilizing Dipole Fields from an Ideal Point Source," Gordon CenSSIS Research and Industry Collaboration Conference 2008.

A. SWAN, "Exciton dynamics in (6,5) carbon nanotubes," Frontiers in optics, 2008

B. B. Goldberg, S. Rémi, C. Metzger, W. Hubbard, and **A. K. SWAN**, "Dissipation Mechanisms in Free Standing Single and Bi-layer Graphene," Frontiers in Optics, 2008

M. C. TEICH, "Multi-Photon and Entangled-Photon Imaging and Lithography," Department of Physics and OSA Section, Humboldt University, Berlin, Germany and Max Born Institute, Berlin-Adlershof, Germany, November 2008.

M. C. TEICH, "Using Entangled Photons to Enhance Tomography, Photoemission, Microscopy, and Lithography," Army Research Office MURI Meeting, Baltimore, Maryland, November 2008.

M. C. TEICH, "Fractal Point Events in Physics, Biology, and Com-

munication Networks," Boston University College of Engineering Distinguished Lectureship, March 2009.

M. C. TEICH, "Multi-Photon and Entangled-Photon Imaging and Lithography," *Eleventh Intl. Conf. on Squeezed States and Uncertainty Relations*, Palacký University, Olomouc, Czech Republic, June 2009.

M. S. ÜNLÜ, "Quantitative Label-Free High Throughput Protein Arrays," 2008 IEEE/LEOS Summer Topical Meetings, Acapulco, Mexico, July 2008.

M. S. ÜNLÜ, I. E. Ozkumur, J. Needham, D. A. Bergstein, B. B. Goldberg, A. Yalcin, P. S. Spuhler, R. Irani, and C. DeLisi, "Applications of Optical Resonance to Biological Imaging and Label-free Protein Microarrays," EMBC08, Vancouver, Aug. 20-24, 2008.

M. S. ÜNLÜ, "Label-free protein micro-arrays for diagnostics," UIG - TASSA Nanoteknolojiye Ürüne Dönüştürülebilir Arastirma ve Ticarilestirme Konferansi ve Proje Pazarı, Istanbul, Dec. 2008.

M. S. ÜNLÜ, "Optical Interference: Biological Imaging and Label-free Protein Microarrays," University of Illinois, April 2009.

M. S. ÜNLÜ, "Optical Interference: Biological Imaging and Label-free Protein Microarrays," University of New Mexico, April 2009.

M. S. ÜNLÜ, "Etiketsiz Protein ve DNA Dizin Algılaması: Kişiyi Özel Sağlık Hizmeti," TUBA (Turkish Academy of Sciences) Forum, June 2009.

Patents and Disclosures

A. TAUBIN, K. Kulikowski, **M. KARPOVSKY**. Power Balanced Gates Invariant to Routing Capacitance Mismatch, U.S. Patent Application No. 60/015,972. July, 2008.

Liberty L. Gunter, Kanin Chu, Charles R Eddy Jr., **T.D. MOUSTAKAS**, Enrico Bellotti, "GaN-based Permeable-Base Transistor and method of fabrication", US Patent No: US 7,413,958B2. August 2008.

T. D. MOUSTAKAS and Jasper Cabalu, "Optical Devices Featuring Textured Semiconductor Layers" European Patent Application No. 06 827,176.6 (Published on August 6, 2008- Publication number 1952 449).

T.D. MOUSTAKAS and Philip Lamarre, Method for Growing Se-

lective Areas on Substrate and Devices Thereof", Provisional Patent Application No. 60/961,829

T.D. MOUSTAKAS, "Low-cost blue/UV LEDs with very high photon conversion and extraction efficiency for white lighting" U.S. Provisional Patent Application No. 61/068,605

V. SALIGRAMA and **J. KONRAD** and P.-M. Jodoin, "Video processing system employing behavior subtraction between reference and observed video image sequences", PCT Patent Application No.-PCT/US08/79839, Oct. 2008.

M. S. ÜNLÜ and M. K. Emsley, "Reflective Layer Buried In Silicon and Method of Fabrication," United States Patent Issued, No. 7,501,303, 10, March 2009.

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 Systems & Sciences:** signal and image processing, and control and communication systems;
- » **Computer Systems Engineering:** hardware, software applications, and computer and communication networks.

Applied Electromagnetics

Horenstein, Mazumder

This laboratory is devoted to problems in experimental electromagnetics with a primary focus on medical and industrial electrostatics, micro-electromechanical systems (MEMS), and sensors. Current projects include transdermal injection of medicinal nanoparticles via pulsed electric fields, development of a passive laser communication node using a MEMS retro-reflective mirror, the design of a “smart-joint” variable-stiffness endoscope, the use of an electrodynamic screen to remove dust particles from solar electric installations, and the development of a new type of electrostatic-based, dry power inhaler.

Biological Sensing and Imaging

Ruane, Ünlü

The Biological Sensing and Imaging Laboratory develops optical, electrical, and computational methods to study biological problems. Researchers develop sensing and imaging devices that emphasize label-free, high throughput data collection on extremely small quantities of biomaterials. Applications include disease and biohazard detection, drug discovery, and equipment development. Projects include the Resonant Cavity Imaging Biosensor which applies hyperspectral IR imaging of transmissive and reflective resonant optical cavities for DNA and protein measurements; the Fabricator—a mask-free optical synthesizer for bio-arrays (the “Fabricator” project) used in RCIB and other biochip systems, and self-interference microscopy. The group is interdisciplinary, with engineers, physicists, chemists, and biologists, and encourages undergraduate researchers.

Biomedical Optics and Biophotonics

Bigio

The focus of research in the Biomedical Optics and Biophotonics Laboratory is the development of minimally-invasive diagnostics and therapeutics based on optical and photonic technologies. Faculty often collaborate with clinical researchers who test the new technologies on animals or human subjects. With noninva-

sive optical measurements, there is minimal risk to the patient, but significant medical benefits are possible. Some of the ongoing projects include:

- » “Optical biopsy”: development of fiber-optic probes that perform spectroscopic measurements on tissue in vivo and noninvasively to instantly diagnose cancer and other pathologies in specific organ areas.
- » “Optical pharmacokinetics”: fiber-optic probes designed to measure drug concentrations in tissue, dramatically reducing the number of animals required for drug studies. This can also be used to determine the optimum type and dosage of novel (light-activated) chemotherapy agents for individual patients.
- » 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.

Broadband Wireless Communications

Carruthers

This laboratory supports research projects on the design, theory, and prototyping of broadband wireless communication systems. The major focus is on the use of light as the transmission medium for high-datarate indoor wireless local-area networks. The laboratory includes facilities for the fabrication and testing of experimental prototypes as well as computing resources for system design and analysis.

Complex BioSignal Processing

Nawab

Complex Signal Processing is an umbrella term use 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.

Computational Electronics

Bellotti

The Computational Electronics group develops software to study semiconductor materials and to perform electronics and optoelectronics device simulation. The group also uses commercial simulation software to simulate for technologically mature semiconductor devices. The laboratory is equipped with state-of-the-art computing and software tools, including two computer clusters, one SGI ALTIX 350 (16 CPUs, 64GB of memory and 1TB disk array) running Red Hat Linux, and an AMD Opteron Cluster (32 CPUs and a 6TB disk array) running Gentoo Linux. The lab also operates high performance PCs and printers.

Computer Architecture and Automated Design

Herbordt

Work focuses on experimental computer architecture, particularly on the application of emerging technology to computationally intensive applications. Projects include developing design tools for application specific coprocessors, designing MPP router switches, vision computers, and the application of configurable computing to bioinformatics.

Control of Discrete Event Systems

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 including communication and sensor networks, manufacturing, transportation, and command/control. CODES research 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

Embedded Systems

Qin

Research in embedded systems covers design methods and performance evaluation tools. This includes system level design of embedded multiprocessor systems, fast system simulation techniques using multi-processing, high-level modeling of digital systems, and functional test generation of microprocessors.

Functorial Electromagnetic Analysis

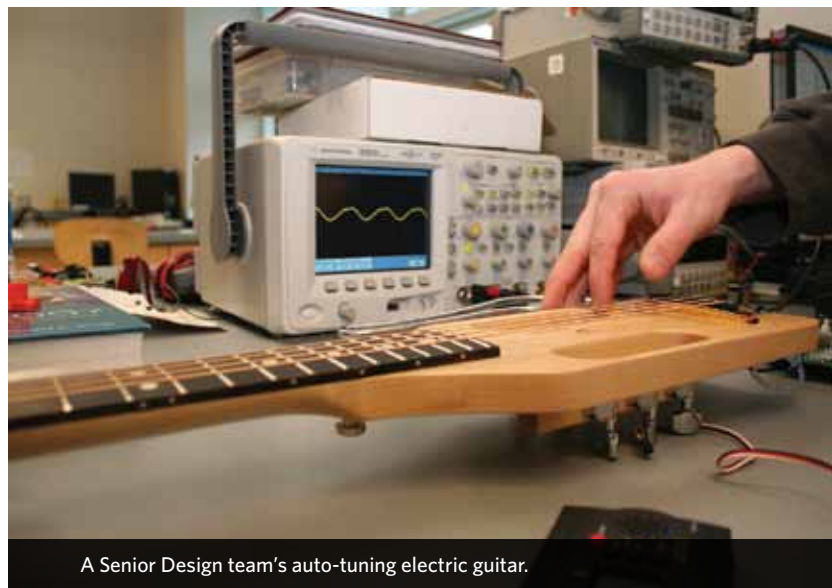
Kotiuga

The Functorial Electromagnetic Analysis laboratory 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 focussed 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.

Imaging Science

Mendillo, Semeter

Affiliated with the Boston University Center for Space Physics, the ISL applies state-of-the-art optical imaging technology to the study of the Earth, Moon, planets, and comets. Activities include equipment design and fabrication, field campaigns to observing sites world-wide, and digital signal processing.



A Senior Design team's auto-tuning electric guitar.



Post doctoral researcher Ahmet Yanik conducting photonics research.

Integrated Nanophotonics and Biosensing Systems

Altug

The capability to confine and manipulate photons at nanometer-length scales can open up unprecedented opportunities in both the fields of classical and quantum information processing, as well as in fundamental life sciences. The Integrated Nanophotonics and Biosensing group is developing nanophotonic devices for optical communications and on-chip biosensing. For communication applications, researchers are developing ultrafast lasers, ultra-efficient light emitting diodes and photonic crystal devices that can slow down light. For biotechnology applications, plasmonic nanostructures and photonic crystal cavities are being used for realization of high-throughput, ultra sensitive, and label free biosensors. To accomplish the group's goals, new computational modeling and advanced nanofabrication techniques are being developed, including nano/bio-patterning and microfluidics. Its biosafety level-2 lab is capable of cell culturing and includes a modified AFM for surface functionalization. The lab also houses state-of the art optical measurement equipments and computational clusters.

Lightwave Technology

Morse

One of the few university laboratories capable of designing, fabricating, and characterizing silica optical fibers, Lightwave Technology research focuses on developing new processing techniques for optical fibers, high-power optical fiber lasers, and a variety of optical fiber sensors. Researchers are developing a new technique for combining multimode pump radiation into double clad fibers. The facility consists of a fabrication labora-

tory with three glass lathes including a Nextrom MCVD system, an optical laboratory with numerous pump lasers for fiber lasers, five isolation tables, and an 8m optical fiber draw tower, outfitted with Nextrom widening and control equipment. In addition, there is a CVD laboratory for studies of thin films.

Multi-Dimensional Signal Processing

Karl

The MDSP lab conducts research in the areas of multidimensional and multiresolution 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) focuses on topics in ubiquitous distributed computing. Current research includes (a) the investigation and development of low-power wireless video camera networks, (b) applications in ecological monitoring using remote cameras, (c) the exploitation of mobility in vehicular networks, (d) visual light communications—communications using LED lighting as the network substrate, and (e) body area networking using multi-tier networking components.

Nano-DNA

Cerrina

DNA is the molecule that encodes the “blueprint” of living organisms. Research in the Nano-DNA laboratory looks at the creation of synthetic DNA by using a combination of techniques from the semiconductor industry, chemistry, and biology. Thus, the work is highly interdisciplinary. Broadly speaking, researchers work in both Nanotechnology and Synthetic Biology. The DNA synthesized can be used to replace natural DNA entirely or in bits and pieces, to create altogether new biological functions and also to create novel nanostructures, where DNA can be used as “smart” construction material. Nanotechnology is based on the ability to fabricate smaller and smaller devices and structures, and the lab studies methods and techniques to push patterning (lithography) to the true nanometer region. For this, beams of electrons

or X-rays are used, and the group collaborates closely with the semiconductor industry. Both experimental work (especially in the DNA area) and theoretical studies (in lithography) are conducted.

Nano-spectroscopy

Swan

Research in the Nano-spectroscopy Lab uses both elastic and inelastic light scattering to probe properties of nanoparticles, with the largest research effort focused on individual carbon nanotubes. Optical techniques include resonant Rayleigh scattering, interference techniques, resonant Raman scattering, and photo luminescence.

Network Computing

Karpovsky

The Network Computing Laboratory studies interconnection network topologies; routing, network flow control, and deadlocks in multicomputer networks; multicast and broadcast fault-tolerance in interconnection networks; modules for realization (nodes and routers); performance metrics and scalability; message passing interference, protocols and programming, scalable coherent interconnect (SCI), and distributed shared memory; network of workstations (NOW); case studies of high performance scalable networks; and cluster computing.

Networking and Information Systems

Starobinski, Trachtenberg

This lab is involved in providing novel perspectives to modern networking with emphasis on scalability, heterogeneity, and performance. Its research roots into the mathematical fields of graph theory and algorithms, probability and stochastic processes, and coding theory with applications to content synchronization, network monitoring, wireless spectrum management, and advanced networking for scientific applications.

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.

Optical Characterization and Nanophotonics

Goldberg, Ünlü, Swan

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 exhibit important physical properties not necessarily predictable from observations of either individual constituents or large ensembles. Researchers in this lab develop and apply advanced optical characterization techniques to the study of solid-state and biological phenomena at the nanoscale. 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; micro resonant Raman and emission spectroscopy of individual 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 the research projects including development of resonant cavity enhanced photodetectors and imaging biosensors for DNA and protein arrays.

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 nanophotonics and life sciences that outperform conventional solutions. Experimental projects include quantum cryptography in metropolitan network, super-resolution phase sensors based on quantum dispersion cancellation effect, quantum imaging and microscopy with spatial aberration cancellation, quantum spectroscopic ellipsometry for characterizing nanoscale devices in semiconductor industry and proteomics, and high-resolution fluorescent correlation spectroscopy and microscopy.

Research and development projects at QCM Laboratory concentrate on:

- » Quantum optical device engineering using parametric amplification in specially designed periodically polled nonlinear structures, entanglement manipulation and processing on a chip, micro- and nano-photonics, ultra-fast quantum optics

- » High-performance single-photon detection and correlation measurement in a wide spectral range from ultraviolet to mid-infrared and terahertz
- » Quantum information processing, quantum communication and cryptography, linear-optical quantum computing, quantum networks
- » Quantum bio-photonics: characterization and diagnostic of biological materials and devices in life sciences, picosecond-resolution fluorescent correlation spectroscopy in the visible and in the infrared spectral range for early disease diagnostic

Quantum Photonics

Teich

Research studies in the Quantum Photonics Laboratory (QPL) focus on photonic systems that rely on the quantum properties of light. Experiments are carried out on single-photon detection; the photon-counting statistics of various sources of light; and the response of the human visual system to small numbers of quanta incident at the retina. Investigations are conducted on multi-photon and entangled-photon absorption, photoemission, microscopy, and lithography; as well as on nonlinear optical processes such as parametric down-conversion and second-harmonic generation. Research is carried out on quantum-imaging paradigms such as quantum optical coherence tomography (QOCT); photon-counting optical coherence tomography (PCOCT); and digital quantum imaging based on entangled-photon qubits in spatial-parity space.

Radio Communications and Plasma

Lee, Semeter, Knepper

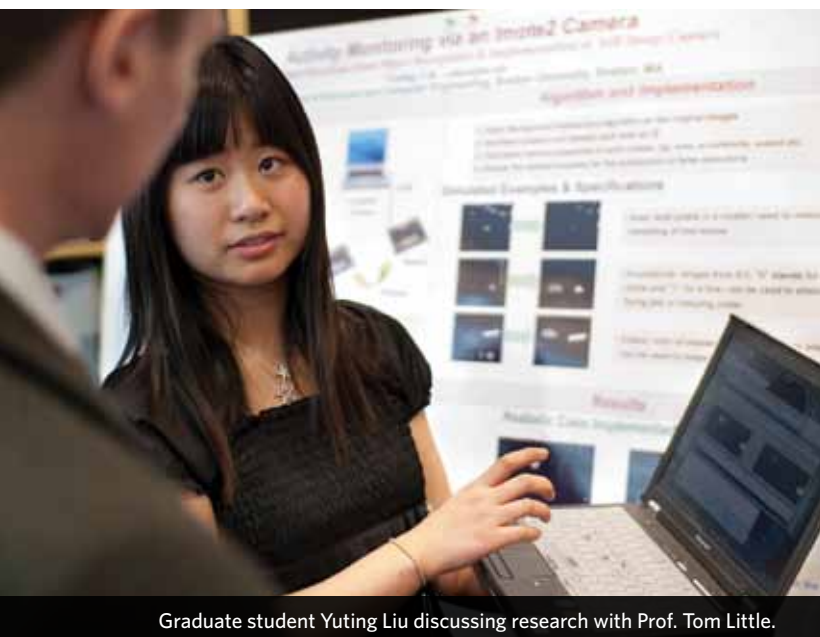
Field experiments are conducted in this lab using ground-based facilities and spacecraft-borne instruments to investigate radio-wave propagation and interactions with ionospheric plasmas, with applications to establishing artificial radio communication paths. Laboratory experiments with a large, toroidal plasma device are also conducted to study the microwave interactions with magnetoplasmas, simulating and crosschecking the results obtained in the field experiments.

Semiconductor Photonics

Paiella

Semiconductor Photonics research 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, researchers are 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. 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.



Graduate student Yuting Liu discussing research with Prof. Tom Little.

Sensor Networks

Cassandras, Paschalidis

Sensor networks are formed by a typically large number of small battery-powered nodes that can sense their respective environments, process information, communicate (mostly wirelessly), and on occasions move in their physical environment. Sensor networks give rise to a rapidly expanding array of applications from building/industrial automation, environmental, agricultural, and wildlife monitoring, monitoring of critical infrastructure, and health monitoring. Research spans fundamental problems in the design, optimization, and control of these networks such as energy-aware routing, power management, multi-access control, and optimal coverage. Specific applications and protocols are also investigated including node localization, formation detection, and anomaly detection.

Testing, Reliable, and Secure Computing

Karpovsky, Levitin, Taubin

Members of the Reliable Computing Laboratory conduct research on a broad variety of topics, including the design of computer chips; efficient hardware testing at the chip, board, and system levels; functional software testing; efficient signal processing algorithms; coding and decoding; fault-tolerant message routing for multiprocessor systems; and the design of reliable computer networks. In addition, research is conducted on architectures based on asynchronous circuits for computer security and side-channel attacks resistance.

Visual Information Processing

Konrad

The VIP Laboratory provides computational and visualization infrastructure for research in the area of visual information processing. The topics of interest are: retrieval, analysis, compression, and transmission of visual information, whether in the form of still images, video sequences, or multimedia data. Two research thrusts are currently pursued. Videopsy (video autopsy) is concerned with the analysis of streaming video data from networked cameras. Some of its goals are: segmentation and tracking of moving objects, detection of normal and abnormal events, characterization of object flow patterns. The second thrust is concerned with the analysis, compression and visualization of stereoscopic and multiscopic (3-D) imagery. One application of this research is in the next-generation of 3-D multimedia communications, while another is in biomedical visualization. Some of the problems studied are: disparity estimation (correspondence) under occlusions, wavelet-based compression in space-time, data pre-filtering for automultiscopic rendering. The VIP Laboratory is equipped with a network of state-of-the-art work-

stations to serve computational needs, while its visualization infrastructure includes 2-D and 3-D digital cameras and capture systems, as well as 3-D displays (shuttered and 9-view automultiscopic "Synthagram").

VLSI and Neural Networks Systems

Hubbard

The VNNS group designs, builds, and tests innovative architectures that span a wide variety of VLSI applications in electrical, biomedical, and defense-related fields. Chips designed using digital and analog integrated circuit methodologies are built using CMOS technologies and tested in the lab. The group is equipped with a full suite of design tools and testing instrumentation for analog and digital systems. Applications include neural-net processing, single-chip large-molecule and DNA analyzers, and chips that emulate the functioning of the mammalian peripheral auditory system for the purpose of weapons classification and localization. Recent work has moved in the direction of algorithm development and FPGA implementations for event-based processing of signals from special-purpose hardware, the prototypes of which originating in the VLSI lab. This hardware is now being advanced by a spun-out, local company started by former students, the second one of which the VNNS Research Lab has produced.

Wide Band Gap Semiconductors

Moustakas

This laboratory investigates the growth, fabrication, and characterization of devices based on the family of III-Nitride semiconductors. The materials are grown by MBE, MOCVD, HVPE and Gas cluster Ion-beam deposition (GCIB). The current research focus is in the development of optical devices (blue, green, and UV-LEDs, UV-LDs, optical modulators, detectors), electronic devices (high power diodes, transistors and thyristors) and electromechanical devices (SiC/III-Nitride MEMS sensors). Materials physics issues are also addressed and the group collaborates closely with Professor Enrico Bellotti in the area of theoretical modeling, Professor Karl Ludwig (Physics) in the area of materials structure, Professor Kevin Smith (Physics) in the area of electronic structure, and Professor Roberto Paiella in the area of devices based on intersubband transitions.

Affiliated Research Centers

Center for Computational Science

<http://satchmo.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 the Office of Information 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, IBM pSeries 690, an IBM pSeries 655, 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.

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 Space Physics

<http://www.bu.edu/csp>

The Center for Space Physics provides a focus for research and graduate training in space physics. It is a multidisciplinary center within the Graduate School of Arts and Sciences that includes faculty from the College of Engineering and the College of Arts and Sciences. The Center carries out a wide variety of research in many fields of space physics including space plasma physics; magnetospheric physics; ionospheric physics; atmospheric physics; and planetary and cometary atmospheric studies.

The mission of the Center is to promote and foster space physics research and to provide a central base for that research and for the teaching of space physics, especially at the graduate level. The Center seeks to fulfill this mission by creating an intellectual atmosphere conducive to research and to the exchange and exploration of new ideas. The Center organizes a seminar

series in space physics as well as internal research discussion groups, and often hosts visits of scholars from the United States and abroad. Although the Center itself offers no degree program, graduate education is a major component of Center activities. Graduate students from programs in Astronomy, Applied Physics, and Engineering conduct their thesis research at the Center. The Center provides a formal link between research groups in the Colleges of Engineering and Arts and Sciences, allowing them to co-locate research students and post-doctoral associates to allow greater interaction to everyone's benefit. The Center also provides administrative support for research projects, particularly in the areas of grant management and proposal development.

Photonics Center

<http://www.bu.edu/photonics>

To help industry bridge the gap between basic research and practical application, Boston University launched the Photonics Center in 1994 with \$29 million in seed funding from the federal government. The Center is now forging true business partnerships in which companies draw on the University's exceptional expertise and resources in engineering, science, medicine, and management to build actual product prototypes and spawn a growing stream of new companies.

The Photonics Center at Boston University is a bold new model for university-industry collaboration. It has been established to work directly with investors and industrial partners to turn emerging concepts in photonics technology into commercial products. The Center is staffed and equipped to help industry partners reduce the technical and financial risk involved in developing new ideas, refining them in the laboratory, building working prototypes, and starting up companies. To date the Center has forged joint ventures with a dozen companies to develop new products in data storage, environmental monitoring, optoelectronics, and biotechnology.

In 1997, the University completed the nine-story, 235,000 square-foot Photonics Building to house this ambitious initiative. The \$85 million facility includes a full complement of state-of-the-art laboratories as well as meeting rooms, lecture halls, and an entire floor devoted to incubator space for start-up companies that complements its existing incubator at 1106 Commonwealth Avenue. Faculty affiliated with the Center have in-depth expertise in all aspects of photonics technology, including the core areas of opto-electronics, photonic materials, data storage, imaging systems, medical applications, and sensors.

Resources available to industry partners, government, faculty, and students through the Photonics Center support development and testing of ideas and products. These resources include several research and development laboratories: Scanning Infrared Near-Field Microscopy Laboratory, Optoelectronic Device Characterization Laboratory, Femtosecond Laser Facility, Photochemical Processes Laboratory, Photonic Systems Engineering Laboratory, Liquid Crystal Display Laboratory, Quantum Imaging Laboratory, Precision Optics Laboratory, Optoelectronic Materials Laboratory, Precision Measurement Laboratory, Optoelectronic Processing Facility, Laser Measurement and Fiber Optic Sensors Laboratory, Magnetic and Optical Devices Laboratory, Near-Field Scanning Optical Microscopy Laboratory, Picosecond Spectroscopy Laboratory, and the Advanced Electronic Materials and Devices Processing Research Laboratory.

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 (CenSSIS) is a National Science Foundation (NSF) Engineering Research Center (ERC), one of an elite group of only nineteen ERCs in the nation. It seeks to revolutionize the ability to detect and image objects that lie underground or underwater, or are embedded within cells, inside the human body, or within man-made structures. CenSSIS is a collaborative effort of four academic institutions: Boston University, Northeastern University, Rensselaer Polytechnic Institute, and the University of Puerto Rico at Mayagüez; and four strategic affiliates: Massachusetts General Hospital, Memorial Sloan-Kettering Cancer Center, Lawrence Livermore National Laboratory, and the Woods Hole Oceanographic Institution. Together, the CenSSIS partnership works with industrial partners who provide their insight into research challenges.

The Center's primary focus is on detecting, locating, and identifying objects obscured beneath a covering media, such as underground plumes, tumors under the skin or developmental defects in an embryo. Utilizing electromagnetic, photonic, or acoustic probes, CenSSIS will engage biomedical and environmental problems, developing techniques for sensing subsurface conditions. Projects integrate new methods of subsurface sensing and modeling, physics-based signal processing and image-understanding algorithms, and image and data information management methods. Research topics being addressed include: humanitarian de-mining, multilayer hyperspectral oceanography, 3-D subretinal visualization, nonlinear ultrasound medical imaging, subcellular biological imaging, electrical impedance tomography, acoustic diffraction tomography, and multi-sensor

civil infrastructure assessment.

Overall, the CenSSIS program is a vehicle enabling substantial leverage of industrial investments because of the substantial level of funding available for basic research. In addition to research, the Center has established programs for education, industry collaboration, and technology transfer. An important outcome of this process is the education of students well-trained in these crucial fields for the future of public health and the preservation of the planet's physical resources.

Center for Information and Systems Engineering (CISE)

<http://www.bu.edu/systems>

The Center for Information and Systems Engineering (CISE) provides an interdepartmental home for faculty and students interested in research in information and control systems theory and its relevance to various application domains encompassing the analysis, design, and management of complex systems that have come to prominence as a result of the information, communication, and computation revolution.

Information and systems engineering research at Boston University is strong and accomplished. Approved by the Trustees in 2002, with management support added in Fall 2002, CISE has raised the visibility of that strength and fostered greater interactions among researchers.

The Center fosters interdisciplinary collaboration and research in emerging applications and the use of methodologies such as Optimization methods, Information theory, Control theory, Applied probability and statistics, Simulation and modeling. Primary application interests are in the areas of automation, robotics, and control; communication, networking and information systems; production, service and supply chain systems; and signal processing and pattern recognition.

As of June 2009, CISE has grown from thirteen to twenty-eight affiliated faculty from the Departments of Mechanical Engineering, Biomedical Engineering, and Electrical & Computer Engineering in the College of Engineering; the Departments of Computer Science and Mathematics & Statistics in the College of Arts and Sciences; and the Department of Operations Management in the School of Management. There are approximately sixty graduate students affiliated through these faculty. CISE maintains a searchable data base of academic "systems" publications authored by the affiliated faculty and their students.

As of November 2004, CISE launched the Sensor Network Consortium (SNC) to facilitate interactions among the academic community and industry participants who support the growth of the sensor network industry through focused research and development activities. The SNC's goals are to develop, test and

accelerate adoption of sensor network related technologies in strategic applications areas; develop strategic partnerships to access federal and regional research funding; and educate graduate students and facilitate their involvement with industry. Industry participation includes a diverse group of companies, start-ups, system integrators and adopters of sensor network technology that currently includes Arch Rock Corporation, BP International, Ember Corporation, The Hartford, Honeywell, IBM, Millennial Net, Mitre Corporation, SAP, Siemens Building Technologies, Sun Microsystems, and Textron Systems.

Electrical & Computer Engineering Department faculty affiliated with CISE are Professors Alanyali, Baillieul, Carruthers, Cassandras, Castañón, Ishwar, Karl, Levitin, Little, Paschalidis, Saligrama, Starobinski, and Trachtenberg. The application interests of their CISE related research include Automation, Robotics and Control; Communications, Networking and Information Systems; Production and Service Systems and Supply Chain Management; and Signal Processing and Pattern Recognition. Professors David Castañón and Ioannis Paschalidis currently serve as Co-Directors of the Center. Several ECE faculty also serve on the CISE Management Committee.

Center for Remote Sensing

<http://www.bu.edu/remotesensing>

The Center was established in 1986 as a facility for scientific research in the fields of archaeology, geography, and geology. The Center uses satellite images and other data from airborne and ground sensors to study the Earth and its resources, particularly groundwater. This includes the monitoring of environmental changes due to both natural processes and human activities. In 1997, the Center was selected by NASA as a "Center of Excellence in Remote Sensing."

Center for Nanoscience and Nanobiotechnology

<http://nanoscience.bu.edu>

Boston University formed the Center for Nanoscience and Nanobiotechnology (CNN) to advance academic and technological research and development by extending discoveries in nanoscale materials and platforms toward applications that examine and seek to understand and manipulate biological systems. The Center serves as a hub for nanoscience researchers from the Charles River and Medical Campuses and builds interdisciplinary research and training. The Center connects scientists and engineers from disparate disciplines with each other in seminars, meetings, joint visitors programs, interdisciplinary courses, industrial collaborations, and seeded projects.

CNN has three core functions: First, to develop interdisciplinary research and education in nanoscience and nanobiotechnology; second, to develop and run an industrial liaison program that partners researchers with external companies for mutual benefit; and third, to connect researchers to resources for technological commercialization. CNN and affiliated faculty are also involved in outreach activities, organizing hands-on activities, discussions, and panels on nanoscience for grade school students and local organizations and museums.

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.

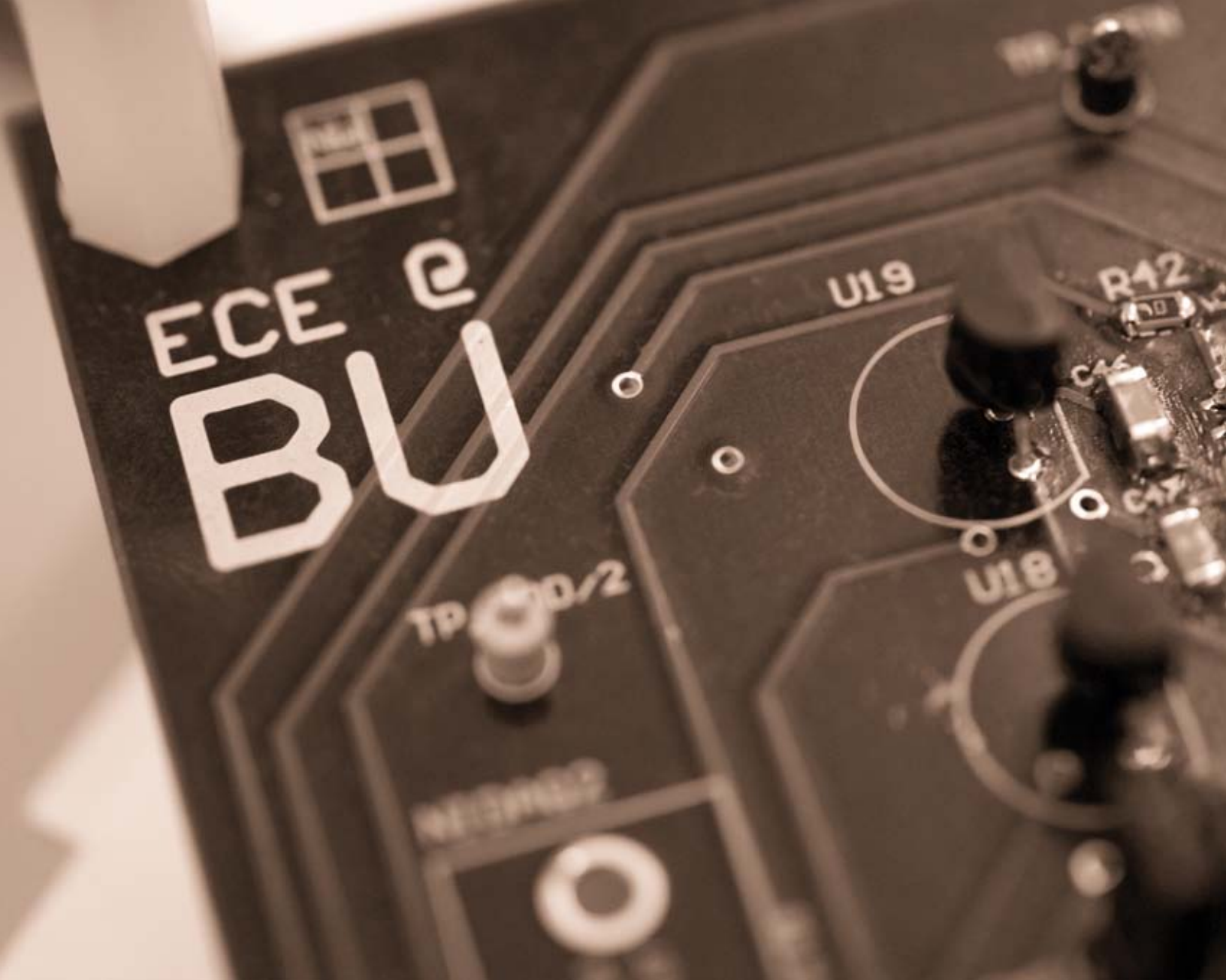
The Center focuses on the creation and application of a new generation of smart light sources whose properties are fully controllable and tunable in terms of their spectral composition, color temperature, polarization, and spatial and modulation properties. These solid state light sources, adaptable 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. Localized directional communication provides 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, to foster the development of a new, globally competitive science and technology workforce.

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