

Boston University
**Electrical & Computer
Engineering**



*Annual Report
2006-2007*

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Message from the Chair

My tenure as Chair of the ECE Department, which spanned 13 years, came to completion at the conclusion of this Summer. This period saw major changes occur at the Department, College, and University levels, under the leadership of three Deans of Engineering, three Provosts, and three Presidents. It has been a privilege and an honor to have had the opportunity to be at the helm of a Department with such fine faculty members during a time of unprecedented enhancement and growth, and I am very proud of the significant progress we have made. I believe that sense of pride and excitement permeates the Department.

The Department has grown significantly in size, from 32 to 44 faculty members. I had the pleasure of recruiting and being the first to welcome 27 of the current ECE faculty. The Department has also developed in stature, as its research funding more than tripled during this period. We have established one of the world's finest research programs in both photonics and information sciences and systems. I am particularly proud of the success experienced by many

of the ECE faculty during their junior years; a remarkable 13 of our faculty members have received the NSF CAREER award.

Our undergraduate curriculum is outstanding and our laboratory facilities are first class. The ABET reviews, traditionally painful affairs for the Department Chair, were twice highly successful. The graduate program has grown substantially, with doctoral enrollment doubling since 1994, and the graduate curriculum has been substantially enriched, including the creation of a new MS photonics degree. ECE has been at the center of new interdisciplinary research centers, such as CISE, CNN, and the Photonics Center. Strong links with other research centers have been continuously nurtured. It has been a great pleasure to witness the outstanding work ECE faculty and students perform with colleagues at the Center for Space Physics, in particular.

Attaining excellence requires hard work and devotion. Gaining recognition usually follows, but does take time. In the latest US News annual ranking, the department has ascended to the top 50 in both our EE program (43rd) and our CE program (46th). Despite the relatively

short history of our graduate program, it is reassuring to be in this league, but given the quality of our faculty, programs, and infrastructure, I have faith that we will rapidly advance to higher ranks in years to come.

I am also proud to have nurtured a culture of faculty governance, an inclusive open-door philosophy, and a spirit of citizenship and camaraderie. I am hopeful that this ingrained culture will continue under the new leadership.

To the faculty and staff who provided support, understanding, criticism, or inspiration through the years, I am most thankful.

The Department will be in the good hands of Professor David Castañón, as Chair ad interim, and I eagerly await the successful conclusion of the search for a new Chair. I am very optimistic about the future of the ECE Department.

The time has come for me to change my course. I have ambitious plans for new research directions, book writing projects, and new teaching assignments and curricular development. To every thing there is a season — I look forward to my new season.

Sincerely,

Bahaa E. A. Saleh

This report provides a detailed description of the instructional and research activities of the faculty, staff, and students of the Department of Electrical and Computer Engineering (ECE) at Boston University during the 2006-2007 academic year. Instructional activities are reported for Fall 2006, Spring 2007, and Summer 2007 semesters. Publications and scholarly activities, as well as budget information, are reported for the 2007 fiscal year (July 1, 2006 to June 30, 2007). Key data for this year are also compared to previous years to show progress and identify trends. More information on ECE's recent activities is reported at the department web site, <http://www.bu.edu/ece>.

1.1 Faculty

The Department of Electrical and Computer Engineering continued to actively recruit new faculty members possessing outstanding research credentials in selected thrust areas this year. One new junior faculty member, **HATICE ALTUG**, was appointed at the Assistant Professor (tenure-track) rank in January 2007. Altug,

a nanophotonics scientist, has done groundbreaking research in photonic-crystal nanocavity laser arrays at Stanford University and her research has been highlighted in Nature and other photonics publications. This is an important addition to our photonics research team, which is becoming one of the strongest in the world.

Sabbatical leaves this year included Irving Bigio in Spring 2007 and Selim Ünlü in both the Fall 2006 and Spring 2007 semesters.

Faculty Awards and Honors

HATICE ALTUG was awarded "Best Research Paper" at the annual IEEE LEOS Conference in Montreal, Canada for her paper entitled "High Speed Dynamics of Photonic Crystal Nanocavity Lasers."

IRVING BIGIO won the BU College of Engineering Faculty Service Award for his outstanding contributions to programs, committees and organizations within the College and University. Bigio was also an Invited Nominator for the 2007 Nobel Prize in Physics.

DAVID CASTAÑÓN was appointed to

the United States Air Force Scientific Advisory Board. The Board promotes the exchange of the latest scientific and technical information that may enhance the accomplishment of the Air Force mission. Castañón was also named President Elect of the IEEE Control Systems Society and received the 2007 ECE Award for Excellence in Teaching.

LEV LEVITIN was elevated to Life Fellow of the IEEE.

BAHAA SALEH was named the recipient of the 2006 Kuwait Prize for Basic Sciences. This prestigious international prize is awarded annually by the State of Kuwait to "recognize distinguished accomplishments in the arts, humanities and sciences." Saleh is honored for his extensive contributions to optical sciences and will receive the prize from the Amir of Kuwait at a ceremony in Kuwait this year where he will also deliver a public lecture.

VENKATESH SALIGRAMA was elevated to Senior Member of the IEEE.

ANNA SWAN was elevated to Senior Member of the IEEE.

SELIM ÜNLÜ received several awards and honors this year. In January, Ünlü was elevated to IEEE Fellow for his "contributions to optoelectronic devices." He was also elected as Vice President, Membership and Technical Activities, Americas, IEEE LEOS. Ünlü was also honored abroad with a Turkish Scientific Foundation (TUBITAK) fellowship for visiting scientists and was selected by the Australian Research Council Nanotechnology Network (ARCNN) to be a 2007 Distinguished Lecturer.

Six ECE professors received BU College of Engineering Dean's Catalyst Awards. **LUCA DAL NEGRO** and **ROBERT KOTIUGA** received the award for their proposal "Symbolic Dynamics for the Design and Engineering of Localized Giant Fields on Aperiodic Metal Nanostructure Arrays on Silicon Chips;" **MASOUD SHARIF** and **SELIM ÜNLÜ** received the award for their proposal "Towards High Throughput and Sensitivity Optical Biosensors via Signal Processing Algorithms;" and **PRAKASH ISHWAR**, **THOMAS LITTLE**, and **JANUSZ KONRAD** received the award for their proposal "Development of a Wireless Video Sensor Network Research Platform." These proposals were chosen for their ability to "represent the program's stated goals of innovative cross-cutting, collaborative research in one or more of [its] umbrella groups."



HATICE ALTUG joined the ECE Department as Assistant Professor (tenure-track) on January 1, 2007. She received her Ph.D. in Applied Physics from Stanford University in 2006 where she served as President of the school's OSA chapter. Her work demonstrating the world's fastest on-chip semiconductor laser appeared as the cover story in Nature Physics (July 2006) and was highlighted in Nature Photonics (September 2006) and Laser Focus World Magazines (December 2006). Altug's work on nanocavity lasers garnered her Best Paper awards at both the 2005 and 2006 IEEE LEOS Conferences along with a first place Research Excellence Award at the 2005 conference. She also received the first place award in the Inventors' Challenge competition of Silicon Valley with her work on micron scale all-optical switches. Her work on slow light and nano-cavity lasers has been featured on the cover of Applied Physics Letters and highlighted in several magazines. Prof. Altug's research interests include design and implementation of high performance and ultra-compact nano-photonics devices and sensors including lasers and all-photonics switches and their large-scale on-chip integration for communication and bio-sensing applications.



Professor **IRVING BIGIO**, who is jointly appointed in the ECE and Biomedical Engineering departments, was the winner of the 2007 Faculty Service Award. The College of Engineering Executive Board chooses a faculty member who has made outstanding contributions to the College through involvement in programs, committees, and organizations within the College and University.

1.2 Undergraduate Program

This year we continued improving our EE and CSE programs with two new courses introduced to replace previous requirements in both programs. Introduction to Engineering Computation (ENG EK127), approved in Spring 2006, replacing the older course ENG EK126, was taught for the first time in Fall 2007. The major change involved teaching the entire course using MATLAB as the programming language, rather than a combination of MATLAB and C++. This was done in response to feedback from our students and faculty that the older course failed to sufficiently prepare our students for the extensive use of MATLAB later in the curriculum. A new second course in software, SC327 Introduction to Software Engineering, was approved in the Fall of 2006 and taught for the first time in Spring 2007. This is a required course for CSE majors, a computer elective for EE majors, and a technical elective for other engineering programs. (See details in Section 3.6)

Enrollment in the BS programs dropped slightly from last year, down about 10% from 273 students to 244 students in the Electrical Engineering (EE) and Computer Systems Engineering (CSE) programs. The drop in CSE enrollments seems to have hit a bottom in 2005/2006, as enrollments in the first three years are all higher than CSE senior enrollment. CSE enrollment is now 38% of the total undergraduate EE/CSE enrollment, up slightly from 36% last year. For freshmen and sophomores enrollment is about 50% CSE and 50% EE. The number of EE and CSE BS degrees awarded this year were 55 and 17, respectively. (See details in Section 3.1 and enrollment history in Section 6.2.)

Efforts to enhance the undergraduate laboratories are successfully ongoing, with new equipment, maintenance, and upgrades this year at a total cost of \$122,167.32. In both classrooms and laboratories, emphasis is placed on design, laboratory practice, and applications. Successful ideas that were initiated in previous years, such as the Teaching Workshop, the ECE Senior Project Day, and the ECE Teaching Excellence Award, continued this year. (See the Undergraduate Programs section for more information.)

Undergraduate Student Awards

Students **GREGG FISCHER**, **NAMAN GUPTA**, **PHILIP KIM**, and **KURT MATARESE** were se-

lected by Senior Design faculty as recipients of the 2007 P.T. Hsu Award for the best overall ECE senior design project.

Additionally, three other Senior Design teams were honored for their efforts on ECE Day with Best Presentation awards. These teams consisted of **RONALD HAYDUK**, **TIMOTHY LOUGHRAN**, **STEPHEN SNYDER**, and **MARCO TAVERNINI**; **ILYA GRIBOV**, **ROBERT LEVY**, **KEVIN MADER**, and **JIMMY NG**; and **GEORGE BISHOP**, **PETER DIB**, **BRANDI PITTA**, and **NOAM YEMINI**.

1.3 Graduate Program

In 2006-2007, four PhD students were awarded Dean's Research Fellows (DRF) and matriculated in ECE in Fall 2006. Three of these students will be continuing their degree programs and are making excellent progress in their programs. Ten new graduate students matriculated in Fall 2006 with Graduate Teaching Fellowships (GTF). Six of these GTFs have been offered Research Assistantships for the Fall 2007 semester. For the Fall 2007 semester, we have recruited four new Dean's Fellows (DF) and 13 new GTFs.

The BU Photonics Center continued the Photonics Fellowship program funding photonics graduate students in the sciences and engineering. The program grew out of the belief that greater interdisciplinary research and education in photonics will require strong support of doctoral students. The awards are divided into two types: full-year Junior Assistantships and two-semester Senior Assistantships. Three ECE PhD students, **I. EMRE OZKUMUR**, **KRISTINA DRISCOLL**, and **ANDREA ROSALES GARCIA** were recipients of Senior Student Awards. The selection for these Awards is merit based, and students were evaluated based on criteria that included academic record, scores on standardized tests, recommendation letters, publications, conference presentations, participation in the Photonics Center community, and recommendation of the graduate committee of the affiliated BU department. This cohort of students, including seven others from AME, BME, Physics, MFG, and Chemistry, will contribute to building an interdisciplinary Photonics Community.

Graduate Student Awards

ECE graduate students made an excellent showing in the 2007 Science and Engineering Day. The "Center for Information and Systems Engineering Award" was received by **ASHRAF AL DAUD** for his poster "Secondary Pricing of Spectrum in Cellular CDMA Networks" (Advisor: **MURAT ALANYALI**). The "Center for Nanoscience and Nanobiotechnology Award" was received by **ASHWIN GOPINATH** for his poster, "Giant Field Enhancement and Plasmon Localization in Two-dimensional Deterministic Aperiodic Arrays of Metal Nanoparticles" (Advisor: **LUCA DAL NEGRO**). The "Photonics Berman Future of Light Award" was received by **KRISTINA DRISCOLL** for her poster "Closing the terahertz gap with III-nitride based intersubband light emitting devices." (Advisor: **ROBERTO PAIELLA**) In its third year, the "Electrical and Computer Engineering Award" was shared by two students: **SHIHCHIN CHIU** and **YIRONG PU** for their presentation of the poster "DSP Implementation of a Biomimetic Acoustic Localizing System." (Advisor: **ALLYN HUBBARD**)

Graduate student **JOHN HENSON** received the 2006/2007 ECE Graduate Teaching Fellow of the Year Award.



John Henson receiving the ECE Graduate Teaching Fellow of the Year Award from Prof. Tom Little

1.4 Research

New research funding this year totaled about \$7.3M in awards for research, of which \$4.6M were awarded to ECE Principal Investigators (PI) and \$2.7M were awarded to ECE faculty members working as Co-PI on projects outside of the Department. Of the PI awards, 33 were for new research projects, while 14 awards were for continuing projects. (See Section 5.4 for details on research funding.)

During this year, research funding has supported 94 research assistant students who have had the opportunity to expand their knowledge from the classroom into cutting edge research.

This year, **THEODORE MOUSTAKAS** received \$320k in funding from the Department of Energy (DOE) for the confirmation of his project Blue/UV LEDs for white lighting; \$125k in funding from NASA to continue to develop a deep UV laser for identification of biological substances during exploration of Mars; and \$350k from the DOE through a subcontract with the University of Nevada, Las Vegas for Green LED research.

DAVID CASTAÑÓN and **CLEM KARL** received funding from the DOD/Air Force in the amount of \$345k for a MURI award in conjunction with the Center for Information and Systems Engineering (CISE) through a subcontract with Ohio State University Research Foundation relative to fusion and sensor management for automatic target exploitation. **CLEM KARL** received an award in the amount of \$83k in conjunction with CISE for a DOD/Air Force award to develop a foundation for Automatic Target Recognition. **VENKATESH SALIGRAMA**, in conjunction with CISE, received a DOD/Navy award in the amount of \$76k for Network Sensor Systems for Urban Target Recognition.

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 seventh year with Research Thrust 1 led by **BAHAA SALEH** and funded at \$125k; Research Thrust 2 led by **DAVID CASTAÑÓN** and funded at \$292k; and the education program led by **MICHAEL RUANE** and funded at \$59k.

ALLYN HUBBARD continued his research regarding two Photonics Center projects that contributed funding for REDOWL in the amount of \$465,878 and for Helmut in the amount of \$150k.

This year, the ECE faculty, academic staff,

and graduate students published 68 research papers in archival journals, authored, co-authored or edited 21 books or book chapters, gave 80 invited lectures, and made 121 conference contributions (papers, abstracts, and presentations). They have also filed 19 patents or patent disclosures. (See Section 5.3 for a complete listing of faculty publications.) The Department continued its Research Spotlight Seminar series this year and three ECE faculty presented highlights of their research.

1.5 Special Events

ECE Day 2007

Initiated in 1997, ECE Day is a forum for ECE seniors to present their capstone projects and graduate students to present their research posters. Held at the end of the Spring semester, ECE Day 2007 included 31 graduate research posters, 18 senior design presentations, and one senior thesis presentation attended by students, faculty, alumni, and industry representatives. (For more information on ECE Day 2007 see Section 3.4.)

BARC 2007: Boston Area ARCHitecture Fifth Annual Workshop

MARTIN HERBORDT and **WEI QIN** organized the workshop with sponsorship from Intel Corporation and Altera Corporation. Held on January 26, 2007 in the Photonics Center Building, BARC brought together more than 120 computer architecture experts from academia and industry across New England and beyond. The workshop was composed of numerous informal oral and poster presentations, two invited talks, and long discussion breaks ideally suited to provide feedback opportunities to preliminary studies and exposure to students close to finishing.

Attendees hailed from institutions and in-

dustry including Brown University, Harvard University, Massachusetts Institute of Technology, University of Connecticut, University of Massachusetts Amherst, VMWare Inc., Advanced Micro Devices Inc., Intel Corporation, and Heterogenous Computing, LLC.

FUDCon Boston 2007: Fedora Users and Developers Conference

FUDCon is a conference/summit that focuses on the Fedora Project (a flavor of Linux) and all things related. This includes infrastructure issues, both technological and governmental/intermutual, development issues, community issues, marketing issues and the state of the



ECE seniors present at ECE Day 2007

project, among other topics. FUDCon Boston 2007 was sponsored by ECE (and other BU departments), Google, Dell, Red Hat, KDE, and Wiley and held in the Photonics Center Building from January 2-4, 2007.

In contrast to previous conferences, FUDCon Boston 2007 was organized as a Bar Camp, which is an “un-conference” where people interested in a wide range of issues come together to teach and learn. Rather than having scheduled speakers, sessions were pitched and voted upon by the 150 attendees the morning of the Bar Camp. Elected sessions were put on a schedule and many small groups formed for intense group learning. Ultimately, this format encourages all attendees to teach, to talk, and to participate. Following the Bar Camp portion of the conference, a smaller “Hackfest” was held for attendees to work on several Fedora projects including packaging, quality assurance, infrastructure, and Yum.

2.1 Faculty



MURAT ALANYALI

Assistant Professor

- » Ph.D., University of Illinois, Urbana- Champaign 1996
- » Communication networks; performance analysis and optimization; stochastic systems
- » 2003 NSF CAREER Award
- » 2004 Legacy Gift Award, College of Engineering
- » Associate Editor, IEEE Control Systems Society Conference Editorial Board



HATICE ALTUG

Assistant Professor

- » Ph.D., Stanford University, 2006
- » Nano-photonic devices and sensors; photonic switches for communication and bio-sensing applications
- » 2006 Best Research Paper, IEEE LEOS Conference



ENRICO BELLOTI

Associate Professor

- » Ph.D., Georgia Institute of Technology, 1999
- » Computational electronics; semiconductor materials and device simulations; power electronics; parallel computing
- » 2005 NSF CAREER Award
- » 2003 ONR Young Investigator Award



IRVING BIGIO

Professor

- » Ph.D., University of Michigan, 1974
- » Medical application of optics, lasers, and spectroscopy; biophotonics; nonlinear optics; applied spectroscopy; laser physics
- » Fellow - Optical Society of America, American Society for Lasers In Medicine and Surgery, American Institute for Medical & Biological Engineering
- » 2007 Faculty Service Award
- » Los Alamos Inventor Awards, 1994, 1996, 1999



RICHARD BROWER

Professor

- » Ph.D., University of California, 1969
- » Molecular dynamics simulation for biomolecules; lattices methods for QCD and statistical mechanics; quantum field theory of strings and particles
- » A.P. Sloan Research Fellow, SLAC and M.I.T., 1974-1976
- » Past Managing Editor, *International Journal of Computational Physics*



MAJA BYSTROM

Associate Professor

- » Ph.D., Rensselaer Polytechnic Institute, 1997
- » Source and channel coding; multi-media communications; image processing
- » 1999 NSF CAREER Award
- » 2005 ECE Award for Excellence in Teaching
- » 2001 Fulbright Award
- » Associate Editor, Signal Processing Letters



DAVID CAMPBELL

Professor & Provost

- » Ph.D., Cambridge University, 1970
- » General nonlinear phenomena and complex systems; novel electronic materials, electron transport in semiconductor superlattices
- » Fellow - American Physical Society, American Association for the Advancement of Science
- » Editor-in-Chief, Chaos; Editor, Physics Reports



JEFFREY CARRUTHERS

Associate Professor &

Associate Chair for Undergraduate Studies

- » Ph.D., University of California, Berkeley, 1997
- » Wireless infrared communications; broadband communications; mobile and wireless networks
- » 1999 NSF CAREER Award
- » Senior Member, IEEE
- » 2001 ECE Award for Excellence in Teaching



DAVID CASTAÑÓN

Professor

- » Ph.D., Massachusetts Institute of Technology, 1976
- » Stochastic control; estimation optimization; image understanding and parallel computation
- » Associate Director, CenSSIS; Co-Director, BU CISE
- » IEEE Control Systems Society Distinguished Member Award.
- » 2007 ECE Teaching Award
- » Associate Editor, Computational Optimization and Applications; Past Associate Editor, IEEE Transactions on Automatic Control



LUCA DAL NEGRO

Assistant Professor

- » Ph.D., University of Trento, 2003
- » Optical amplification phenomena and laser physics; optical spectroscopy of semiconductor nanostructures; photonic crystals, anderson light localization and aperiodic dielectrics; nanophotonics and plasmonics.
- » Dean's Catalyst Award, 2007



AZZA FAHIM

Assistant Professor

- » Ph.D., Cairo University, 1984
- » Electric machines; computations in electromagnetics



ROSCOE GILES

Professor

- » Ph.D., Stanford University, 1975
- » Advanced computer architectures; distributed and parallel computing; computational science
- » Cited as one of the "50 Most Important Blacks in Research Science in 2004" by The Career Communications Group (CCG)
- » A. Nico Haberman Award, CRA
- » 1996 ENG Award for Excellence in Teaching



MARTIN HERBORDT

Associate Professor

- » Ph.D., University of Massachusetts, 1994
- » Computer architecture; electronic design automation; communication switch design; computer vision architecture; bioinformatics
- » 1997 NSF CAREER Award
- » 2004 Legacy Award, College of Engineering



MARK HORENSTEIN

Professor & Associate Dean for Graduate Studies

- » Ph.D., Massachusetts Institute of Technology, 1978
- » Applied electromagnetics; electrostatics; microelectromechanical systems
- » President, Electrostatics Society of America
- » Editor-in-Chief, Journal of Electrostatics



ALLYN HUBBARD

Professor

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



PRAKASH ISHWAR

Assistant Professor

- » Ph.D., University of Illinois Urbana-Champaign, 2002
- » Distributed and collaborative signal processing; multi-terminal information theory; statistical modeling and inference; image and video coding and processing; multiresolution signal processing and optimization with applications to sensor networks; multimedia-over-wireless security.
- » 2006 NSF CAREER Award
- » 2007 Dean's Catalyst Award



W. CLEM KARL

Professor

- » Ph.D., Massachusetts Institute of Technology, 1991
- » Multidimensional and multiscale signal and image processing and estimation, particularly applied to geometrically and medically oriented problems
- » 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

- » Ph.D., Leningrad Electrotechnical Institute, 1967
- » 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
- » Fellow, IEEE
- » Past Associate Editor, Tomography and MRI, IEEE Transactions on Image Processing



RONALD KNEPPER

Professor

- » Ph.D., Carnegie Mellon University, 1969
- » VLSI integrated circuit technology; SiGe BICMOS device and circuit modeling; silicon CMOS & bipolar devices; numerical device simulation; RF/analog IC design
- » Fellow, IEEE
- » 1989 IBM Outstanding Innovation Award; 1988 IBM Division Award; 1983 IBM Outstanding Technical Achievement Award
- » Past Editor, Solid State Electronics



JANUSZ KONRAD

Associate Professor

- » Ph.D., McGill University, 1989
- » Image/video processing and coding, stereoscopic and 3-D imaging, visual sensor networks, multimedia systems, M-D signal processing
- » Senior Member, IEEE
- » 2001 IEEE Signal Processing Magazine Award
- » 2004-2005 EURASIP Image Communications Best Paper Award
- » 2007 Dean's Catalyst Award
- » Associate Technical Editor, IEEE Communications Magazine; Associate Editor EURASIP Journal on Image and Video Processing



ROBERT KOTIUGA

Associate Professor

- » Ph.D., McGill University, 1985
- » 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
- » Member, Electromagnetics Academy
- » 2007 Dean's Catalyst Award



MIN-CHANG LEE

Professor

- » Ph.D., University of California, San Diego, 1977
- » Radio communications; experimental plasma physics; ionospheric plasma physics
- » Past Associate Editor, AGUs Radio Science



LEV LEVITIN

Professor

- » Ph.D., USSR Academy of Sciences, Gorky University, 1969
- » Information theory; physics of communication and computing; complex and organized systems; bioinformatics; quantum theory of measurement; reliable communication and computing
- » Life Fellow, IEEE
- » Member, International Academy of Informatization

**THOMAS LITTLE***Professor & Associate Chair for Graduate Studies*

- » Ph.D., Syracuse University, 1991
- » Mobile Ad Hoc Networks (MANETs); multimedia computing; computer networking; software engineering; embedded sensor networks
- » 1995 NSF CAREER Award
- » 2007 Dean's Catalyst Award
- » Editorial Board Member, ACM/Springer Multimedia Systems, Journal of Multimedia Tools and Applications

**THEODORE MORSE***Professor*

- » Ph.D., Northwestern University, 1961
- » Photonic material processing; optical fiber fabrication, lasers, and sensors; high power double clad fiber lasers
- » Fulbright Fellow, Germany

**THEODORE MOUSTAKAS***Professor*

- » Ph.D., Columbia University, 1974
- » Growth by MBE, MOCVD, HVPE and Gas-Cluster Ion Beam Deposition (GCIB); growth, fabrication and characterization of optical devices (UV-LEDs, UV-LDs, optical modulators, detectors), electronic devices (high power diodes, transistors and thyristors) and electromechanical devices (SiC/III-Nitride MEMS sensors); III-Nitride semiconductors (materials growth and device fabrication)
- » Fellow, American Physical Society, Electrochemical Society
- » 1998 ECE Award for Excellence in Teaching

**S. HAMID NAWAB***Professor*

- » Ph.D., Massachusetts Institute of Technology, 1982
- » Applied Signal Analysis (ASA), IPUS architecture for ASA, neuronal behavior imaging, patient status signal analysis, auditory scene analysis
- » 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*

- » Ph.D., University of Illinois, 1973
- » Radar studies of the upper atmosphere and ionosphere; modeling and simulation; global change in the upper atmosphere
- » Associate Director, BU Center for Space Physics

**ROBERTO PAIELLA***Assistant Professor*

- » Ph.D., California Institute of Technology, 1998
- » 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
- » Vice Chair, IEEE Laser and Electro-Optics Society (LEOS), New England Chapter

**WEI QIN***Assistant Professor*

- » Ph.D., Princeton University, 2004
- » Tools, methods and architectures for embedded systems; synthesis and verification of programmable processors; design languages for electronic systems
- » 2006 ECE Award for Excellence in Teaching

**TATYANA ROZINER***Associate Professor*

- » Ph.D., Moscow Scientific Research Institute, 1975
- » Digital design; testing and diagnostics of computer hardware; fault-tolerant computing

**MICHAEL RUANE***Professor*

- » Ph.D., Massachusetts Institute of Technology, 1980
- » Resonant cavity imaging system; micro-magnetics modeling; optical systems; AFRL Loss Cone Imager DSX Satellite
- » Senior Member, IEEE
- » 2004 ASEE New England Section Outstanding Teacher Award
- » 1999 ECE Award for Excellence in Teaching
- » 1991 College of Engineering Faculty Service Award

**BAHAA E.A. SALEH***Professor & Chair*

- » Ph.D., Johns Hopkins University, 1971
- » Quantum optics; nonlinear optics; image processing
- » Fellow, IEEE, Optical Society of America, John Simon Guggenheim Foundation
- » 2006 Kuwait Prize
- » 2004 BACUS Award
- » 1999 OSA Beller Award
- » Deputy Director, Center for Subsurface Imaging and Imaging Systems (CenSSIS)
- » Past Editor-in-Chief, Journal of the Optical Society of America: Optics, Image Science and Vision

**VENKATESH SALIGRAMA***Associate Professor*

- » Ph.D., Massachusetts Institute of Technology, 1997
- » Information and control theory; statistical signal processing; applications to sensor networks
- » 2005 NSF CAREER Award
- » 2003 ONR Presidential Early Career Award
- » 2002 ONR Young Investigator Award



JOSHUA SEMETER

Assistant Professor

- » Ph.D., Boston University, 1997
- » Ionospheric and space plasma physics; spectroscopy of atmospheric airglow and the aurora borealis; image processing; radar systems and radar signal processing
- » 2004 SRI Presidential Achievement Award
- » 2000 Prize Lecture, NSF Cedar Workshop
- » Associate Editor, Journal of Geophysical Research
- » 2006 NSF CAREER Award



ALEXANDER SERGIENKO

Professor

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



MASOUD SHARIF

Assistant Professor

- » Ph.D., California Institute of Technology, 2005
- » Wireless multiuser networks, and communications and information theory
- » 2006 Wilts Prize for the best PhD thesis in Electrical Engineering at Caltech
- » 2007 Dean's Catalyst Award



THOMAS SKINNER

Associate Professor

- » Ph.D., Boston University, 1982
- » Microprocessors; computer networks; operating systems; distributed systems
- » 2003 Microsoft Most Valuable Professional Award
- » 1997 College of Engineering Award for Excellence in Teaching



DAVID STAROBINSKI

Associate Professor

- » Ph.D., Technion, Israel Institute of Technology, 1999
- » Wireless and sensor networks; QOS and traffic engineering; networks performance evaluation
- » 2004 Department of Energy Early Career Award
- » 2002 NSF CAREER Award



ANNA SWAN

Associate Professor

- » Ph.D., Boston University, 1993
- » Development of nanoscale optical self-interference microscopy; optical properties of carbon nanotubes
- » Senior Member, IEEE



ALEXANDER TAUBIN

Associate Professor

- » Ph.D., Electrotechnical University of St. Petersburg, 1981
- » Asynchronous circuit, logic design; computer architecture; CAD; attack resistant hardware
- » Senior Member, IEEE



MALVIN TEICH

Professor

- » Ph.D., Cornell University, 1966
- » Quantum optics and imaging; photonics; fractal stochastic processes; information transmission in biological sensory systems
- » 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
- » Editorial Advisor, Photonics and Physical Electronics, *Physics Today*



TOMMASO TOFFOLI

Associate Professor

- » Ph.D., University of Michigan, 1977
- » Fundamental connections between physics and computation; fine-grained modeling of physics-like systems technology (cellular automata machines) and methodology (programmable matter); personal knowledge structuring
- » Senior Member, IEEE
- » Member, Editorial Board Complex Systems; The Interjournal (on-line)



ARI TRACHTENBERG

Associate Professor

- » Ph.D., University of Illinois, Urbana-Champaign, 2000
- » Error correcting codes; data synchronization (especially for PDAs and mobile networks); sensor-based location detection; algorithms
- » 2002 NSF CAREER Award
- » 2003 ECE Award for Excellence in Teaching
- » Senior Member, IEEE



SELIM ÜNLÜ

Professor

- » Ph.D., University of Illinois, Urbana-Champaign, 1992
- » Near-field optical microscopy and spectroscopy of semiconductor materials and devices; design, processing, characterization and simulation of semiconductor optoelectronic devices; nanoscale imaging of biological samples, biosensors
- » 2005 IEEE Lasers and Electro-Optics Society (LEOS) Distinguished Lecturer
- » 1996 NSF CAREER Award
- » 1996 ONR Young Investigator 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

Research Faculty



FLOYD HUMPHREY

Research Professor

- » Ph.D., California Institute of Technology, 1956
- » Computer simulations of magnetic materials and storage devices; magnetic sensors
- » Life Fellow, IEEE
- » IEEE - 100th Anniversary Gold Medal for Service
- » 1998 Magnetics Society Achievement Award
- » Millenium Medal



FEI LUO

Research Associate Professor

- » Ph.D., Chongqing University, 1991
- » Distributed fiber optic sensors and systems; optical fiber grating sensors; interferometric sensors

Affiliated Faculty



JOHN BAILLEUL

Professor & Chair, Aerospace and Mechanical Engineering

- » Ph.D., Harvard University, 1975
- » Robotics; control of mechanical systems; mathematical system theory
- » IEEE Fellow
- » Elected 40th President of IEEE
- » Distinguished Member, IEEE Control Systems Society
- » Director, Boston University Center for Control and Dynamics of Smart Structures



FAROUK EL-BAZ

Research Professor and Director, Center for Remote Sensing

- » Ph.D., 1964 University of Missouri
- » Remote sensing with emphasis on arid lands; surface features of solar system planets as part of comparative planetology
- » Key member of the Apollo lunar exploration team
- » Member, U.S. National Academy of Engineering



CHRISTOS CASSANDRAS

Professor, Manufacturing Engineering

- » Ph.D., Harvard University, 1982
- » Analysis and control of discrete event dynamic systems; stochastic control and optimization; dynamic control of computer and communication networks
- » IEEE Fellow, 1991 Lilly Fellow
- » IEEE Control Systems Society Board of Governors
- » Editor-in-Chief, IEEE Transactions on Autonomic Control



THEODORE FRITZ

Professor, Astronomy

- » Ph.D., University of Iowa, 1967
- » Space plasma and magnetospheric physics; magneto sphere-ionosphere coupling; substorms; charged particles and compositions; rocket and satellite experiments



SUPRIYA CHAKRABARTI

Professor, Astronomy

- » Ph.D., University of California, Berkeley, 1982
- » Space experimentation; ultraviolet spectroscopy
- » Director, Center for Space Physics



BENNETT GOLDBERG

Professor & Chair, Physics

- » Ph.D., Brown University, 1987
- » Room- and low-temperature, near-field microscopy of semiconductors and biological systems; magneto-optics and magneto-transport of two- and one-dimensional electron fields
- » Alfred P. Sloan Fellow
- » NSF Presidential Young Investigator



SOLOMON EISENBERG

Professor & Associate Dean for Undergraduate Programs

- » Sc.D., Massachusetts Institute of Technology, 1983
- » Electrically mediated phenomena in tissues and biopolymers
- » 1987 NSF Presidential Young Investigator
- » 1990 Metcalf Award for Excellence in Teaching



MICHAEL MENDILLO

Professor, Astronomy

- » Ph.D., Boston University, 1971
- » Low-light level optical instrumentation; signal processing in space physics; planetary atmospheres; GPS satellite communications; space plasmas in the solar system
- » Fellow, American Geophysical Union



JEROME MERTZ

Associate Professor, Biomedical Engineering

- » Ph.D., Université Paris VI & University of California, 1991
- » Development and applications of novel optical microscopy techniques for biological imaging
- » 2002 Aimé-Cotton Prize, French Physical Society
- » 2001 Fabry-de-Gramont Prize, French Optical Society



PETER O'CONNOR

Research Associate Professor, Mass Spectrometry Research

- » Ph.D., Cornell University, 1995
- » Mass spectrometry instrumentation and applications
- » Assistant Director, Mass Spectrometry Resource, Boston University School of Medicine



ERIC SCHWARTZ

Professor, Cognitive & Neural Systems

- » Ph.D., Columbia University, 1973
- » Computational neural science; machine vision; neural anatomy; neural modeling



IOANNIS PASCHALIDIS

Associate Professor, Manufacturing Engineering

- » Ph.D., MIT, 1996
- » Design, performance analysis, and control of communication and sensor networks and manufacturing systems, supply chains, and distribution systems; computational biology; Queueing theory and stochastic systems
- » NSF CAREER Award, 2000



WILLIAM SKOCPOL

Professor, Physics

- » Ph.D., Harvard University, 1974
- » Nanofabrication; device processing; transport experiments in materials

Emeritus Faculty



JOHN BRACKETT

Professor Emeritus

- » Ph.D., Purdue University, 1963
- » Software engineering; software requirements definition; object-oriented testing; rapid prototyping of embedded systems



RICHARD VIDALE

Professor Emeritus

- » Ph.D., University of Wisconsin-Madison, 1964
- » Modeling and simulation, software engineering



THOMAS KINCAID

Faculty Emeritus

- » Ph.D., Massachusetts Institute of Technology, 1965
- » Signal and image processing; neurodynamics; non-destructive testing



MOE WASSERMAN

Professor Emeritus

- » Ph.D., University of Michigan, 1955
- » Semiconductor processing, electronic circuits



DAVID PERREAULT

Professor Emeritus

- » Ph.D., Purdue University, 1968
- » Nonlinear networks; computer-aided design; microprocessors; distributed digital networks

NSF PYI/CAREER Awards

- | | |
|--------------------|---------------------|
| Murat Alanyali | Thomas Little |
| Enrico Bellotti | Venkatesh Saligrama |
| Maja Bystrom | Joshua Semeter |
| Jeffrey Carruthers | Alexander Sergienko |
| Solomon Eisenberg | David Starobinski |
| Bennett Goldberg | Ari Trachtenberg |
| Martin Herbordt | Selim Ünlü |
| Prakash Ishwar | |

ONR Young Investigators

- | | |
|---------------------|------------|
| Enrico Bellotti | Selim Ünlü |
| Venkatesh Saligrama | |

PECASE Award

- Venkatesh Saligrama

Fellows of Technical Societies

IEEE

John Bailleiul	Ronald Knepper
Christos Cassandras	Lev Levitin
Floyd Humphrey	Bahaa Saleh
Mark Karpovsky	Malvin Teich
Selim Unlu	

Optical Society of America

Irving Bigio	Alexander Sergienko
Bahaa Saleh	Malvin Teich

American Physical Society

David Campbell	Malvin Teich
Theodore Moustakas	

American Institute for Medical & Biological Engineering

Irving Bigio	Hamid Nawab
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American Association for the Advancement of Science

Malvin Teich

American Society for Lasers in Medicine & Surgery

Irving Bigio

American Geophysical Union

Michael Mendillo

Electrochemical Society

Theodore Moustakas

Electrostatics Society of America

Mark Horenstein

Acoustical Society of America

Malvin Teich

2.2 Adjunct Faculty

The ECE Department looks outside the department and university for individuals to teach a few specific courses, as the need arises. These individuals bring a vast amount of engineering expertise, in both academic and industrial capacities, to the classroom. The following is a list of people who have helped the Department meet its teaching needs over the past year.

JOHN BRACKETT

SC518 (Spring 2007)

» PhD, Purdue University, 1963

ALAN PISANO

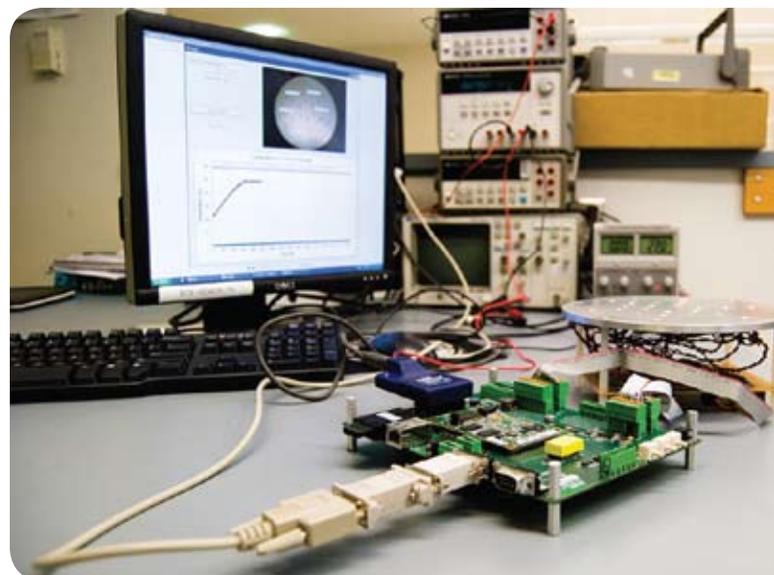
SC463 (Fall 2006) & SC402 (Spring 2007)

» PhD, Northeastern University, 1974

VLADIMIR KLEPESYN

SC578 (Fall 2006) & SC410 (Summer 2007)

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



A Senior Project in the development stages

2.3 Research Staff

NAME	TITLE	ADVISOR
Bergstein, David	Research Associate	Ünlü
Bertazzi, Francesco	Research Assistant	Bellotti
Bhattacharyya, Anirban	Research Associate	Moustakas
Bonato, Cristian	Research Assistant	Sergienko
Calabu, Jasper *	Research Assistant	Moustakas
Chivas, Robert	Research Associate	Morse
Cohen, Reuven *	Research Associate	Starobinski
Dimakis, Emmanouil	Research Associate	Moustakas
Feng, Ning-Ning	Research Associate	Dal Negro
Jaspan, Martin	Senior Research Associate	Sergienko
Kotov, Valeri	Research Assistant Professor	Campbell
Marquez Cruz, Violeta *	Research Assistant	Morse
Minaeva, Olga	Research Assistant	Sergienko
Nasr, Maged	Research Associate	Teich/Saleh
Nikiforov, Alexey	Research Associate	Moustakas
Qin, Xiangping *	Research Associate	Starobinski
Redjdal, Makhlof *	Research Associate	Semeter
Shubochkin, Roman	Research Associate	Morse
Thomidis, Christos	Research Assistant	Moustakas
Van Court, Thomas *	Research Associate	Herbordt
Wong, Wai-Yan	Research Assistant	Teich

* Completed appointment during 2006/2007

2.4 Administrative and Technical Staff

ADMINISTRATIVE STAFF		TECHNICAL STAFF	
Rennie, Wayne	Director	Bardin, Jim	Systems Analyst/Administrator I
Nabiel, Hemayat*	Assistant Director	Berkovitch, Dan	Systems Analyst/Administrator I
Marchioni, Carly	Academic Programs Manager	France, Ryan*/open	MBE Laboratory Manager
Ryan, Gordon	Publications, New Media, and Promotions Administrator	Klepstyn, Vladimir	Electronic/Circuits Laboratory Manager
Santore, Catherine*	Communications Manager*		
Goebel, James	Manager, Technology & Systems		
Caine, Aaron*	Manager, Technology & Systems*		
Jordan, Elbert	Financial Administrator		
McLaughlin, Mark*	Financial Administrator*		
Delakas, David	Grants Administrator		
Perez, Alfredo*	Grants Administrator*		
Open	Senior Programs Coordinator		

*Resigned during 2006/2007

3.1 Academic Programs

The ECE Department continues to pride itself on developing a strong laboratory curriculum to accompany our classroom teaching for undergraduates. We continue to have excellent teaching labs with up-to-date equipment. Undergraduates are encouraged to become involved with research and development efforts in faculty labs through UROP (Undergraduate Research Opportunity Program), work study, or 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.

We continued improving our undergraduate programs this year. This process includes student surveys, student feedback forums, faculty review of courses and outcomes, and implementation of curriculum changes aimed at improving program outcomes.

The capstone design project provides our graduating seniors with real engineering experience and the student projects have continued to be outstanding, with several projects receiving awards. (See page 20 for more details).

Teaching Workshops

The ECE tradition of holding teaching workshops every semester continued this year. Now a requirement (as course SC850) for all new graduate teaching fellows in the College of Engineering, six one-hour workshops were held each semester. These workshops included panel and solo discussions as well as role-playing scenarios on teaching methodology, presentation techniques, pedagogy, and ethics.

ECE Teaching Award 2006/2007

Professor David Castañón (below, right) was the winner of the 2007 ECE Award for Excellence in Teaching. He received the award for his successful launch of the course "SC 381 Probability Theory in ECE", tying probability theory with applications in electrical and computer engineering and integrating better with subsequent ECE courses, and for his long history of involvement in curriculum development, including development of SC330, SC505 and many other courses. Student reviews of Prof. Castañón found him to be enthusiastic, knowledgeable, accessible and responsive.

The ECE Department instituted this award during the 1997-98 academic year to recognize innovation and excellence in teaching in the department. The award, based on nominations from College students, faculty, and staff, carries with it a \$1,000 prize to be used towards instructional activities. A committee of ECE professors and students evaluated the nominees, using teaching statements, classroom material, and student comments. The 2007 ECE Teaching Award Committee, chaired by Professor Carruthers (left), recommended this award.



Enrollment and Degrees Awarded

FALL 2006 ENROLLMENT			
	Electrical	Computer Systems	Total
Freshmen*	27	20	47
Sophomores*	18	26	44
Juniors	44	29	73
Seniors	62	18	80
Total	151	93	244

* Note: ENG Students are not required to declare their major until their junior year.

DEGREES AWARDED	
Electrical Engineering	55
Computer Systems Engineering	17
Total	72

HONORS STUDENTS	
Summa Cum Laude	6
Magna Cum Laude	10
Cum Laude	9
Total	25

3.2 Instructional Laboratories

Control Systems Laboratory

This laboratory houses four ECP model 220 Industrial Plant Emulators for studying the control of practical systems. These systems consist of an electromechanical apparatus including an adjustable mechanical mechanism (plant) with actuators and sensors. Various types of controllers (e.g. PID, State- Feedback, LQR) can be designed and implemented in either continuous or discrete time formulations using a DSP-based real-time controller with a Windows XP 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. *Pisano*

Electronics Laboratory

The Electronics Laboratory has 30 stations, each equipped with a PC, GPIB-controlled Agilent test instruments and National Instruments ELVIS development stations linked by LabVIEW. Sixteen stations have new LeCroy digital scopes. New Agilent MSO mixed signal oscilloscopes were added in summer 2006. This facility supports introductory ECE courses in circuits and electronics with, modern industry-standard equipment and software. The lab also supports more advanced experiments in signals and systems, communications, electromagnetics, and photonics. Senior Design and project students use the lab on an open basis, and freshman EK131/132 modules are held here. A small parts window sells common discrete components. OrCAD software including PSpice supports circuit simulations, schematic capture and PCB layout. *Nawab, Carruthers, Fahim, Horenstein, Knepper, Kotiuga, Lee, Oliver, Roziner, Ruane, Sergienko*

High Performance Computing Laboratory

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

puters at the Center for Computational Science and the Scientific Computing and Visualization Lab. *Giles, Brower*

High Tech Tools and Toys Laboratory

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 undergraduates are supported during the academic year to work on improving stations in the HTTTL. *Ruane*

Microprocessor and PC Laboratory

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. *Toffoli, Giles, Skinner, Taubin*

Senior Project Laboratory

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 throughout the University. Each team has twenty-four hour access to a permanent bench setup with a networked Pentium 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 microcontroller development. Software from MSDNAA is available for all teams. *Ruane, Knepper, Pisano*

Expenditures for Instructional Laboratories 2006-2007

FACILITY	EQUIPMENT	APPROX. COST
Microprocessor Lab and Software Engineering Lab	Lab kits, workstation upgrades, lab supplies, etc.	\$62,802.95
VLSI Lab and Signals/Networks Lab	Software licenses, memory upgrades, etc.	\$14,927.72
Electronics Lab	Lab kits, electronics kits, waveform generators, breadboards, etc.	\$19,533.83
Senior Design Lab	Workstations, project supplies, gifts for senior design awards, etc.	\$5,742.39
Other	General infrastructure upgrades, wireless access, supplies, etc.	\$19,160.43
Total		\$122,167.32

3.3 Undergraduate Courses

COURSE NUMBER	COURSE TITLE	FALL 2006	SPRING 2007	SUMMER 2007
EK131	Intro to Engineering	Lee Horenstein Toffoli Ruane	Giles Morse Konrad	
EK307	Electric Circuit Theory	Fahim Fahim	Fahim Oliver Carruthers Fahim	
EK317	Circuit Theory I	Oliver		
EK318	Circuit Theory II		Kotiuga	
EK440	Intro to Electronic Systems		Horenstein	
EK501	Math Methods I	Kotiuga		
SC327	Intro to Software Engineering		Trachtenberg	
SC311	Intro to Logic Design	Qin Karpovsky	Ruane Karpovsky	Freedman
SC312	Computer Organization	Taubin Brower	Herbordt	
SC330	Applied Algorithms		Trachtenberg	
SC381	Probability Theory in ECE	Castanon	Castanon	
SC401	Signals and Systems	Karl	Bystrom	Carruthers
SC402	Control Systems		Pisano	
SC410	Intro to Electronics	Sergienko Lee Lee Knepper	Lee	Klepstyn
SC412	Analog Electronics		Sergienko	
SC415	Communication Systems	Carruthers	Sharif	
SC416	Intro to Digital Signal Processing	Ishwar	Konrad	
SC440	Intro to Operating Systems	Skinner	Skinner	
SC441	Intro to Computer Networks	Starobinski	Alanyali	
SC447	Software Design	Skinner	Skinner	
SC450	Microprocessors	Giles	Toffoli Giles	
SC455	Electromagnetic Systems I	Semeter	Lee	
SC456	Electromagnetic Systems II		Lee	

3.4 ECE Day Senior Projects

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

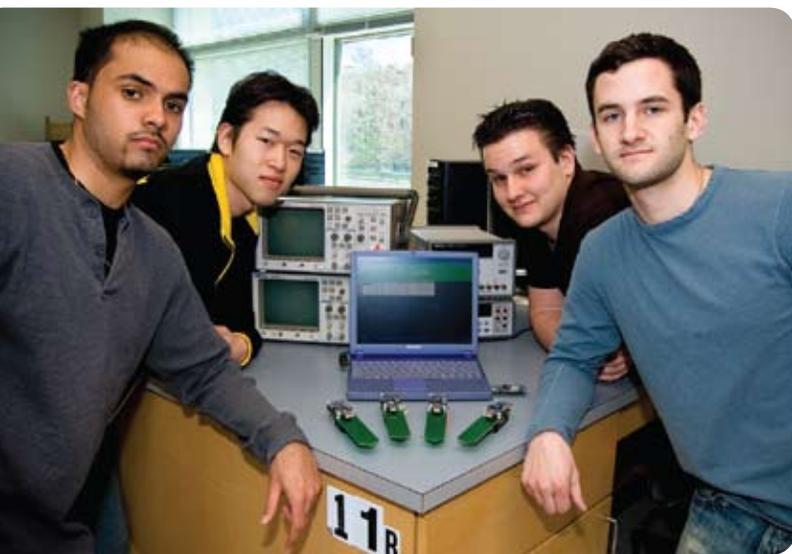
representatives, and fellow students. On May 4, 2007, 18 teams and one B.S. Honors Thesis student presented their projects across two parallel sessions. Best presentation awards for each session were presented at a luncheon for faculty, customers, and seniors.

2007 P.T. Hsu Award

For their successful, working FPGA-based engine control module that went beyond the original customer specifications and their admirable team dynamics, Simon Au, Tina Chu, Eddie Lau, and Richard Yu of Team Designex received the 2006 P.T. Hsu Award.

Since 1982, ECE has honored Professor P.T. Hsu by acknowledging the best overall ECE capstone design project with the P.T. Hsu Award. A faculty committee considers degree of success, difficulty, scope, creativity, cost, project communications, and team effectiveness.

Notable Senior Projects 2006-2007



Team 9 Wi-Green members (l-r): Naman Gupta, Philip Kim, Gregg Fischer, and Kurt Matarese. Winners of the 2007 P.T. Hsu Award

Wireless Greenhouse Sensing System

Good soil is the key to high-quality plants. Coupled with the scale of modern agriculture, successful growing requires the implementation of sophisticated technologies in order to maintain and expand operations. Inefficient and wasteful methods of soil monitoring and plant maintenance commonly develop into dramatic time and cost expenditures for growers.

With this dilemma in mind, the Wi-Green team developed a system that offers a cost-effective and easy-to-use alternative to currently expensive and impractical soil monitoring techniques. Their solution implements a wireless mesh network of sensor nodes allowing for easy, fast, and remote monitoring of soil conditions, including moisture, temperature and relative humidity.

To tie the system together, a user-friendly graphical interface displays current soil conditions at each node, illustrates trends in plant conditions, and alerts the user when emergency conditions occur, enabling growers to easily track problem areas and resolve specific soil issues with pin-point accuracy.

"This system solves grower needs by efficiently monitoring plant conditions and targeting plants in need of care," said Wi-Green team member Gregg Fischer. "As a result, users can save time, energy, water and plant replacement costs."

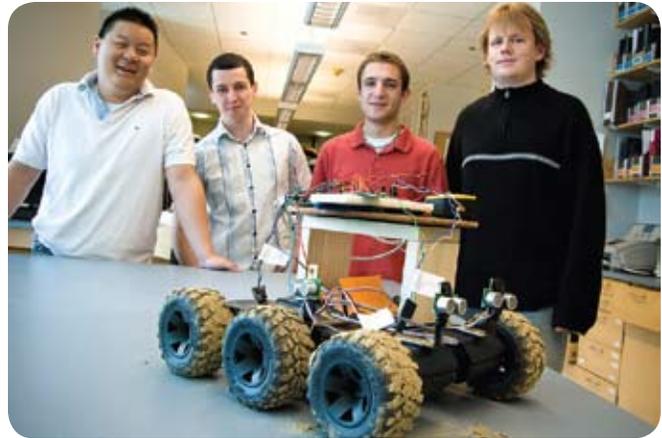
The Wi-Green system is inherently expandable, with each node costing approximately \$110. In the future, however, drops in materials costs combined with technology refinements, could potentially reduce the price-per-node to between \$10 - \$20, broadening the potential user base tremendously.

Esplanade Runner

Esplanade Runner is a system that enables a mobile platform to navigate a route defined using Google maps while avoiding obstacles in its path without human intervention. The system consists of a PDA for high-level navigation algorithms, a microcontroller for real-time obstacle avoidance and intra-component communication, a handheld GPS unit for positional data, and a compass for directional information.

The \$2000 system has a potential impact in both military and commercial applications. Military needs for autonomous vehicles and self-guided navigation are rising at a rapid pace due to an growing emphasis on streamlining operations and increasing safety. In the commercial sector, there is an exploding market for this technology in guiding road vehicles through smart cruise control and automated parallel parking.

"The basic motivation is the same [for both sectors]," said team member, Jimmy Ng. "Create technology to replace human tasks that are trivial, mundane, or dangerous."



Team 5 Esplanade Runner members (l-r): Jimmy Ng, Ilya Gribov, Rob Levy, and Kevin Mader. Winners of the ECE Day Best Presentation Award.



Team 1 Blinky Blocks members receiving the ECE Day Best Presentation Award from Prof. Alan Pisano: Ronald Hayduk, Timothy Loughran, Stephen Snyder, and Marco Tavernini

Urban UClimate

In response to increasing global environmental concern, this project aims to aid in the tracking of harmful pollutants. The urban microclimate monitor tracks certain airborne elements at any Ethernet-equipped location exposed to sunlight. The monitoring factors include temperature, humidity, pressure, carbon monoxide, and ozone. Once data is collected from the environment via sensors it is sent to the microprocessor module wqccccccchere it is processed. Both of these modules are powered by photovoltaic cells and a rechargeable Ni-Cad battery. The data is then sent over Ethernet to a server. Once on the server, the voltages produced from the operating circuits are converted to levels of each environmental factor and stored in a MySQL database. The user can view the data and analyze trends using a web-based interface.

System Building Blocks

LEGO's for grown ups. That's how Team 1 envisioned the system building blocks. A single block does little, but combine several and the system comes to life. The customer for this project sought a system of six blocks that could perform separate functions individually but also work together when combined.

Each block has a task it must perform: one receives digital audio and feeds it to the system; another cycles the system power depending on the presence of people; an LED block converts the audio signal to five visual bands; a speaker block plays back the music; a power block supplies energy; and a connector block acts as a pass through for power and data.

The key to the system is the ability to connect the blocks in any fashion. Male and female power and data connectors on each wall of the blocks allows any two blocks to connect to each other regardless of orientation.



Team 18 Space Monkeys members approaching the stage to accept their ECE Day Best presentation Award: George Bishop, Peter Dib, Brandi Pitts, and Noam Yemini.

3.5 Student Activities

The ECE Department supports two active undergraduate student groups, an IEEE Student Section and the Eta Kappa Nu honor society. These groups held a number of successful events this past year, ranging from lectures and panel presentations to social events for members to educational service activities. Highlights for 2006-2007 are detailed below.

- » The **IEEE** student branch hosted a seminar by Randy Fayan, a software engineer at Avid Technology. He discussed the technology behind Avid's industry-leading and award-winning professional video finishing software.
- » **Eta Kappa Nu** instituted a weekly tutoring session in the Ingalls Engineering Resource Center every Wednesday evening. The tutors are juniors and seniors in EE or CSE, and the subjects covered most frequently were multivariate calculus and electric circuits.



Professor Maja Bystrom

3.6 Continual Program Improvement

Improvement cycles for our undergraduate programs continued during AY 2006/07. The highlights this year were:

1. The software course sequence for Computer Systems Engineering majors was revised and a new course developed. The software sequence for CSE majors is now
 - » EK 127 Introduction to Engineering Computation (revised from EK126)
 - » EC 327 Introduction to Software Engineering (new; replaces CS112)
 - » EC 330 Applied Algorithms for Engineers

EC 327 Introduction to Software Engineering is a new course which was taught for the first time in Spring 2007 semester. The instructor was the course developer, Prof. Trachtenberg. It serves the unique needs of CSE majors who have had an introduction to programming in EK 127 in the MATLAB language. The course serves the following functions: (a) strengthen students proficiency in debugging, optimization, software design, (b) introduce C++ and object-oriented programming (c) introduce memory allocation, file input/output, and data structures concepts (d) introduce industry-standard programming development tools. The course replaces CS 112 in the CSE curriculum. For EE majors, the course is one of three computer electives and can also be used as a technical elective.

2. Our course assessment and teaching evaluations (completed by all students at the end of every course) switched from a paper-based system to a completely online mechanism for the first time. This provides for a faster response to the instructor, allowing the instructor to incorporate student feedback into future course offerings more quickly than was previously possible. In addition, it provides all students an opportunity to provide feedback to the instructor, rather than only those who are attending lecture on the day the evaluations were done in class.

3. The laboratory component of EK307 Electric Circuit Theory was completely redesigned for the first time in more than a decade. The new labs emphasize circuit design: the students are presented with an engineering problem to solve, but are not told how to solve the problem. The nine labs are timed so that students can apply the theory and problem solving techniques they are learning in the lectures to the design problems presented in the laboratory.

4. A systematic review of our pre-requisites of each course was undertaken by the Department Undergraduate Committee. The result was an improved, simplified, and more rational set of pre-requisites for the following seven courses (approved by faculty vote in April 2007): EK307, EC330, EC381, EC440, EC447, EC504, and EC563.

5. The department has decided to renumbered all of its courses from SC to EC, reflecting the change in name of our department from "Systems and Computer" to "Electrical and Computer" some years ago. The change is in effect as of the Fall 2007 semester.

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

4.1 Course and Program Development

The ECE Department continues to refine the graduate curriculum, with several new courses developed and offered during 2006-2007. In addition, several courses that were developed as special topics in 2005-2006 were approved to become part of the regular curriculum and were assigned course numbers.

In Spring 2007, four new courses were offered: SC700 Randomized Network Algorithms by Prof. Starobinski, BE700/SC700 Advanced Optical Microscopy and Biological Imaging by Professor Mertz, SC700 Semiconductor Quantum Structures and Photonic Devices, by Prof. Paiella, and SC500 Introduction to Information Theory by Prof. Ishwar.

During the year, several courses that were originally developed as special topics (SC500 and SC700) were given course numbers and entered into the course inventory:

- » SC544/MN544 Networking the Physical World (Fall 06)
- » SC569 Intro to Subsurface Imaging (phase in: Fall 06)
- » SC591 Photonics Lab I (Phase in date: Fall 06)
- » SC707 Radar Remote Sensing (Spring 07)

The ECE Graduate Committee also recommended a revision of the MS Project guidelines and piloted these revisions in the Spring of 2007. These changes include the adoption of a reader of all MS projects, the use of a standard template for the final MS Project document, and encouragement for more rigorous assessment for grade assignment. The MS Projects were presented in a poster format in this first iteration.

The course SC915 Computer Systems Engineering Project was proposed and approved as an alternative to the MS capstone individual project. This course will be taught in Spring 2008.

In addition to adding courses to the curriculum, the course designations for all ECE courses were changed from SC to EC. This change was made to reflect the shift in the department's programs over the years from Systems and Computer Engineering to Electrical and Computer Engineering. The change will take place beginning in the Fall 2007 semester.

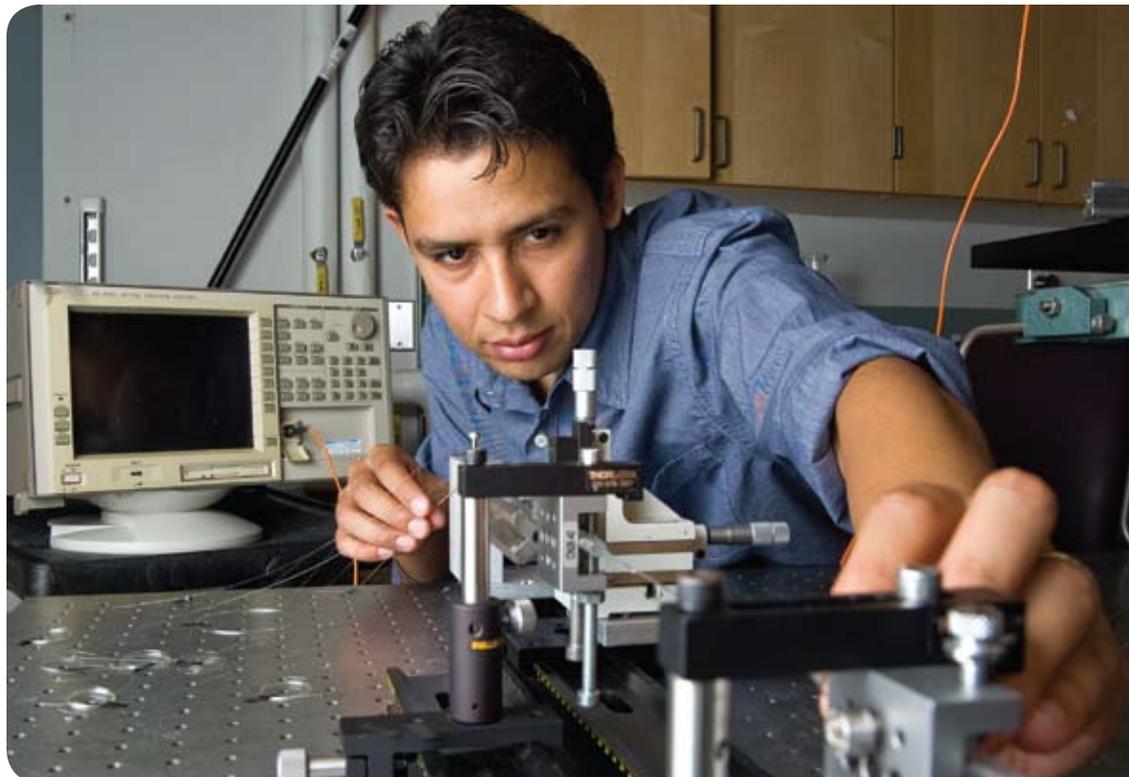
4.2 Graduate Student Recruitment

Four PhD students were awarded Dean's Research Fellows (DRF) and matriculated in Fall 2006. Three of these students will be continuing their degree programs and are making excellent progress. Ten new graduate students matriculated in Fall 2006 with Graduate Teaching Fellowships (GTF); six of these students were offered Research Assistantships (RA) for the Fall 2007 semester. We also recruited four new Dean's Fellows and 13 new GTFs for the Fall 2007 semester.

We received 689 applications for the Fall 2007 semester, up from 614 in Fall 2006, and up from 557 in Fall 2005 (an 11% increase from 2006). There was a total of 357 admits, with 294 MS admits (124 of these applied for the post-BS PhD program), 40 post-BS PhD admits, and 23 post-MS PhD admits. This is in comparison to Fall 2006, which had a total of 324 admits, with 265 MS admits (116 of these applied for the post-BS PhD), 39 post-BS PhD admits, and 20 post-MS PhD admits.

As can be seen from these numbers, the admissions process continues to attract a greater number of applicants (11% over Fall 2006) with more selectivity especially at the PhD level (corresponding 6% increase in PhD Admits). The department requirement that PhD applicants have a clear path to ongoing financial aid continues to moderate the number of PhD admits. In Fall 2004, there were a total of 274 PhD admits, compared with a total of 64 in Fall 2005, 59 in Fall 2006, and 63 in Fall 2007.

In Fall 2006 ECE held a single open house event, resuming from several years of two events. A total of 17 applicants attended; six of whom were non-local. Ultimately 13 of the attendees received an offer for financial aid.



Ph.D. student Gilberto Basilio Sanchez conducts optical fiber research in the Lightwave Technology Laboratory.

4.3 PhD Graduate Student Progress

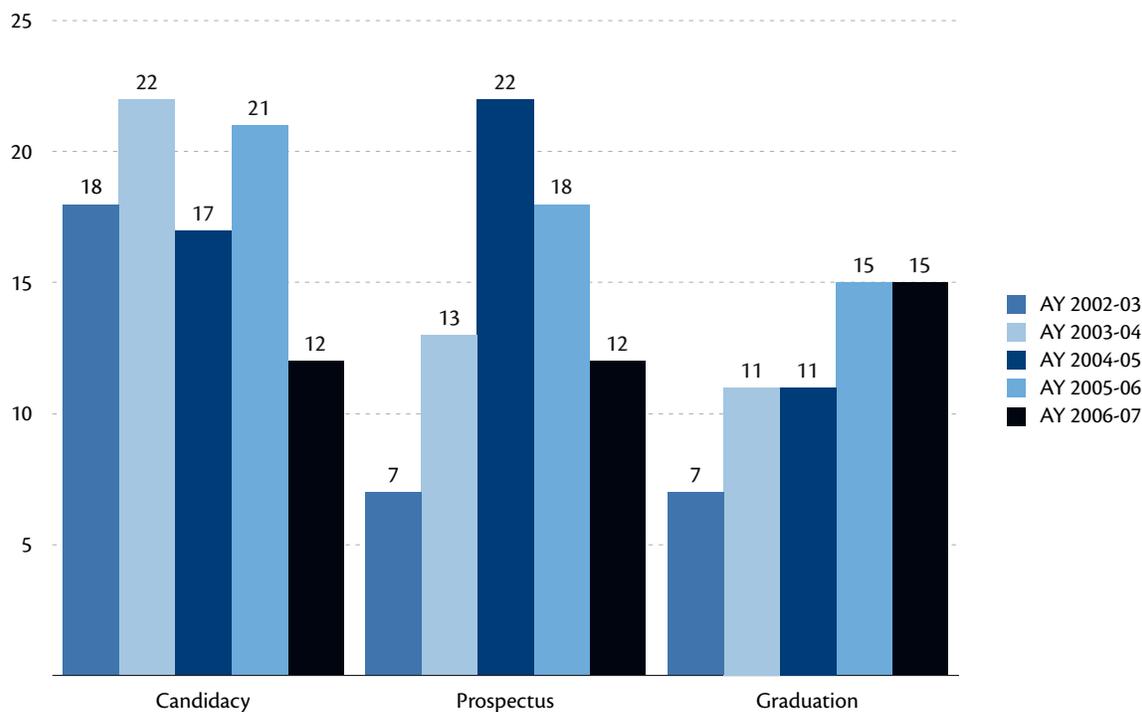
The number of PhD graduates per year is an important measure of the strength of the graduate programs. In prior years we saw the results of the procedural improvements to keep the progress of the PhD students on track. Our requirement that students must pass the PhD prospectus within two years of PhD candidacy was 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. The number of PhD graduates has held constant from the prior year, showing promise to achieving our goal of 20 per year.

4.4 Colloquia and Seminars

The ECE Colloquium Series and the Research Spotlight Series (RSS) continued for another successful year. Prominent speakers from both inside and outside the University gave research talks on current issues. Graduate students continued to attend and contribute to both the Colloquium Series and RSS.

A list of speakers for the academic year for these seminar series is given in section 4.9.

Graduate Student Progress



4.5 New Matriculants

NEW STUDENTS ENTERING 2006-2007									
		Male	Female	FT	PT	GTF	RA	Fellow	DRF
MS	US	26	8	26	8	2	2	1	0
	Intl.	18	5	20	3	1	2	0	0
PHD	US	3	0	3	0	0	3	0	0
	Intl.	7	4	11	0	2	3	0	2
Total		54	17	60	11	5	10	1	2

FALL 2006 MEAN GRE SCORES									
		Verbal	%	Quantitative	%	Analytical	%	Analytical Writing	%
MS	US	520	61	743	78	---	---	4.39	48
	Intl.	493	70	774	86	677	73	4.04	69
PHD	US	588	77	765	84	760	92	4.8	62
	Intl.	535	63	786	89	733	88	4.28	52
Mean		534	68	767	84	723	84	4	58

SPRING 2007 MEAN GRE SCORES									
		Verbal	%	Quantitative	%	Analytical	%	Analytical Writing	%
MS	US	554	70	754	81	---	---	4.79	61
	Intl.	548	68	766	85	615	61	4.38	47
PHD	US	---	---	---	---	---	---	---	---
	Intl.	470	51	740	77	---	---	3.5	17
Mean		524	63	753	81	615	61	4	42

4.6 Degrees Awarded

MS DEGREES AWARDED		PHD DEGREES AWARDED	
Computer Systems Engineering	17	Computer Systems Engineering	12
Electrical Engineering	24	Electrical Engineering	3
Photonics	1	Systems	0
Total	42	Total	15

STUDENT NAME	DISSERTATION ADVISOR	DISSERTATION TITLE
Bach, Edward	Toffoli, Tomaso	A Rational Framework for Computing with Cellular Automata
Bergstein, David	Unlu, Selim	Resonant Cavity Enhanced Multi-Analyte Sensing
Beriont, Walter	Levitin, Lev	A Theoretical and Empirical Study of Dynamics of Web Request Streams
Chivas, Robert	Morse, Ted	Aerosol Deposition Process for Synthesizing Optically Active Nano-Scale Materials
He, Zhihua	Bystrom, Maja	Texture- and Structure-based Image Representation with Applications to Image Retrieval and Compression
Huang, Chien Chih	Ekinci, Kamil	Fabrication, Motion Detection and Amplification Techniques in Radio-Frequency Nanoelectromechanical Systems (NEMS)
Hunt, Stephen	Oliver, William	On the Determination of the Meteoroid Ionization Coefficient using High Power Large Aperture Radar
Kaur, Parminder	O'Connor, Peter	Statistical methods for interpretation of high resolution mass spectra
Kunapareddy, Nagapratima	Bigio, Irving J.	Raman Spectroscopy for the Study of Cell Death
Pavlovich, Julia	Karl, W. Clem	Physics-Based Subsurface Information Extraction by Parametric Inversion
Polimeni, Jonathan	Schwartz, Eric	Characterizing the Two-Dimensional Structure of the V1--V2--V3 Visuotopic Map Complex in Macaque and Human Cerebral Neo-Cortex
Williams, Adrian	Moustakas, Ted	Formation of Gallium Nitride Templates and Freestanding Substrates by Hydride Vapor Phase Epitaxy for Homoepitaxial Growth of III-Nitride Devices
Wu, Tao	Starobinski, David	An Analytical Study of Server Selection for Scalable Internet Services
Xu, Tao	Moustakas, Ted	LEDs based on III-Nitride Quantum Dots and Quantum Wells Grown by Molecular Beam Epitaxy
Zhai, Qingtai	Fritz, Ted	Development of a Novel ΔE -E Particle Identification Telescope Readout System

4.7 Graduate Teaching Fellows

SUMMER 2006	
<i>Student Name</i>	<i>Course</i>
Kang, Wei	SC410
Li, Rui	EK307
Ramakrishnan, Karthik	SC401
Sandifer, Matthew	SC311

FALL 2006	
<i>Student Name</i>	<i>Course</i>
Bangla, Ajay	SC416
Chiu, Shihchin	SC571
Chivas, Robert	Photonics Lab
Dempsey, Peter	SC463/464
El-Zonkoly, Mai El-Sayed	SC410
Graham, Matt	EK307
Hagedorn, Andrew	SC441
Henson, John	SC410
Huang, Chien Chih	SC551
Li, Xia	SC410
Liao, Yitao	SC455
Orten, Burkay	SC463/464
Pavlovich, Julia	SC381
Pu, Yirong	SC312
Raghunath, Savitha	SC410
Rosales Garcia, Andrea	EK307
Shugayev, Roman	SC415
Stojanovic, Ivana	SC401
Sukhwani, Bharat	SC311
Wu, Zeyu	SC450

SPRING 2007	
<i>Student Name</i>	<i>Course</i>
Adams, Jason	SC450
Bangla, Ajay	SC381
Chivas, Robert	Photonics Lab
Dempsey, Peter	SC464
Dorta-Quinones, Carlos	EK307
Entekhabi, Abdol	SC416
Graham, Matthew	EK307
Inanlou, Farzad	SC410
Kulikowski, Konrad	SC535
Li, Xia	EK307
Orten, Burkay	SC464
Raghunath, Savitha	SC312
Rosales Garcia, Andrea	EK307
Shugayev, Roman	SC471
Smirnov, Alex	SC571
Stern, Alvin	EK307
Stojanovic, Ivana	EK307
Sukhwani, Bharat	SC311
Wang, Meijun	SC327
Wu, Zeyu	SC401

4.8 Graduate Courses

COURSE NUMBER AND TITLE		FALL 2006	SPRING 2007	SUMMER 2007
SC500	Special Topics in ECE		Ishwar	
SC501	Dynamic Systems Theory	Dupont		
SC504	Advanced Data Structure	Trachtenberg		
SC505	Stochastic Processes	Saligrama	Saligrama	
SC512	Enterprise Client-Server Software Systems Design	Skinner		
SC513	Computer Architecture	Herbordt		
SC514	Simulation	Vaikili		
SC515	Digital Communication	Sharif		
SC516	Digital Signal Processing	Nawab		
SC518	Software Project Management		Brackett	
SC520	Image Processing and Communication	Konrad		
SC524	Optimization Theory and Methods	Paschalidis		
SC533	Intro to Discrete Mathematics	Levitin		
SC534	Discrete Stochastic Models		Levitin	
SC535	Intro to Embedded Systems		Qin	
SC541	Computer Communication Networks		Alanyali	
SC544	Networking the Physical World	Little		
SC551	Advanced Digital Design	Taubin		
SC560	Intro to Photonics	Dal Negro	Saleh	
SC561	Error-Control Codes	Karpovsky		
SC563	Fiber-Optic Communication Systems		Morse	
SC568	Optical Fiber Sensors	Morse		
SC570	Lasers		Teich	
SC571	VLSI Principles and Applications	Hubbard	Hubbard	
SC574	Physics of Semiconductor Materials	Bellotti		
SC575	Semiconductor Devices		Bellotti	
SC578	Fabrication Technology for Integrated Systems	Klepstyn		
SC579	Microelectronic Device Manufacturing		Cole	
SC580	Modern Active Circuit Design	Knepper		
SC582	RF/Analog IC Design Fundamentals		Knepper	
SC591	Special Topics in ECE Lab	Paiella		
SC700	Advanced Topics in Electrical and Computer Engineering		Starobinski Paiella	
SC707	Radar Remote Sensing		Semeter	
SC710	Dynamic Programming and Stochastic Control		Hu	
SC712	Advanced Software for Computer Engineers		Skinner	
SC713	Parallel Computer Architecture		Herbordt	
SC716	Advanced Digital Signal Processing			
SC717	Image Reconstruction and Restoration		Karl	
SC719	Statistical Pattern Recognition	Bystrom		

COURSE NUMBER AND TITLE		FALL 2006	SPRING 2007	SUMMER 2007
SC724	Advanced Optimization Theory and Methods		Paschalidis	
SC726	Personal Knowledge Engineering	Toffoli		
SC730	Information-Theoretical Design of Algorithms		Levitin	
SC733	Discrete Event and Hybrid Systems		Cassandras	
SC744	Mobile Ad Hoc Networking and Computing		Little	
SC751	Design of Asynchronous Circuits and Systems		Taubin	
SC757	Advanced Microprocessor Design			Montazam
SC761	Information Theory and Coding	Levitin		
SC763	Nonlinear and Ultrafast Optics	Teich		
SC764	Optical Measurement		Swan	
SC765	Biomedical Optics and Biophotonics	Bigio		
SC770	Guided-Wave Optoelectronics		Dal Negro	
SC772	VLSI Graduate Design Project		Hubbard	
SC850	Graduate Teaching Seminar	Nawab	Nawab	
SC892	Seminar: Electro-Physics	Moustakas	Moustakas	



Professor Anna Swan and PhD student Anthony Vamivakas

4.9 List of Colloquia & Seminars

DATE	SPEAKER	TITLE
September 18, 2006 ^a	Qing Zhao Electrical & Computer Engineering University of California at Davis	A Decision-Theoretic Framework for Opportunistic Spectrum Access
October 12, 2006 ^a	Shum Ping Electrical & Electronic Engineering Nanyang Technological University	Photonics and Optical Communication Research in Singapore
October 16, 2006 ^a	Sekhar C. Tatikonda Electrical Engineering Yale University	The Role of Mixing in Message Passing Algorithms
October 23, 2006 ^a	Alfred Hero Electrical Engineering & Computer Science University of Michigan at Ann Arbor	Dimensionality Reduction Approached to Inference on Sensor Networks
October 27, 2006 ^b	Thomaso Toffoli Electrical & Computer Engineering Boston University	Zero-Power Simulation of Dynamical Systems is in Principle Possible. Can We Afford It?
November 03, 2006 ^b	Ioannis Paschalidis Electrical & Computer Engineering Boston University	Optimization of Wireless Sensor Networks
November 06, 2006 ^a	Juyang Weng Computer Science & Engineering Michigan State University	Brain-Inspired Autonomous Mental Development and Computational Mental Models
November 08, 2006 ^a	S. Sandeep Pradhan Electrical & Communication Engineering University of Michigan at Ann Arbor	A Graph-Based Framework for Transmission of Correlated Sources over Broadcast Channels
November 17, 2006 ^b	Jerome Mertz Biomedical Engineering Boston University	New Techniques in Biomicroscopy
November 27, 2006 ^a	Berk Sunar Electrical & Computer Engineering Worcester Polytechnic Institute	Towards a Trusted IC Life-Cycle
November 30, 2006 ^a	Domenico Pacifici Applied Physics California Institute of Technology	Plasmonic Excitation of CdSe Quantum Dots: A Novel Approach to Ultra-Low Power All-Optical Modulation
February 01, 2007 ^a	Ilja Gerhardt Swiss Federal Institute of Technology	Nano-Optics with Single Molecules
February 02, 2007 ^b	G. Hugh Song Gwangju Institute of Science and Technology	Mystery, Magic, and Clairification on Optically-Active Molecules and Crystals: A Pendant's View
February 07, 2007 ^a	Azer Bestavros Computer Science Boston University	If You Build It They Will Come: The snBench Architecture
February 14, 2007 ^a	Srinivas Sridhar Physics Northeastern University	Left-Handed Light
February 21, 2007 ^a	Jose M.F. Moura Electrical & Computer Engineering Carnegie Mellon University	Topology Optimization in Sensor Networks
March 07, 2007 ^a	Joseph A. O'Sullivan Electrical & Systems Engineering Washington University	Computational Optimization for Maximum Likelihood Reconstruction in Transmission Tomography



Professor Alexander Sergienko

DATE	SPEAKER	TITLE
March 15, 2007	Constance Metzger, Ivan Favero Khaled Karrai Center for Nanoscience Ludwig-Maximilian-Universitaet Munich	Laser Cooling of Micro-Mirrors
March 21, 2007 ^a	Surajit Ray Mathematics & Statistics Boston University	Modal Inference: Building the Bridge Between Nonparametric Clustering and Mixture Analyses
March 23, 2007 ^b	Lori Bergeron Museum of Science	The Hall of Human Life: The Museum of Science's Revolutionary World of Contemporary Biology and Technology
March 26, 2007 ^a	Matthew Ceasar Computer Science University of California at Berkeley	Identity-Based Routing
March 27, 2007 ^a	Alfred Hero Electrical Engineering & Computer Science University of Michigan at Ann Arbor	Signal and Image Processing for Magnetic Resonance Force Microscopy
March 28, 2007 ^a	Mana Taghdiri Electrical Engineering & Computer Science Massachusetts Institute of Technology	Automating Modular Program Verification By Refining Specifications
April 06, 2007 ^a	Hayden So Electrical Engineering & Computer Science University of California at Berkeley	BORPH: An Operating System Framework for FPGA-based Reconfigurable Computers
April 09, 2007 ^a	Nachiketh Potlapally Electrical Engineering Princeton University	Three Challenges of Embedded System Security: Performance, Energy and Robustness
April 11, 2007 ^a	Larry Rudolph Computer Science & Artificial Intelligence Laboratory Massachusetts Institute of Technology	Scalable Checkpoints, Watchpoints, and Breakpoints: Breaking Abstraction Barriers
April 12, 2007 ^a	Alon Orlitsky Electrical & Computer Engineering University of California at San Diego	Information Theory and Probability Estimation: From Shannon to Shakespeare via Laplace, Good, Turing, Hardy, Ramanujan and Fisher

Colloquia & Seminars (cont.)

DATE	SPEAKER	TITLE
April 18, 2007 ^a	Mohammed N. Islam Electrical Engineering & Computer Science University of Michigan at Ann Arbor	All-Fiber Mid-Infrared Super Continuum Source & Applications
April 23, 2007 ^a	Richard Osgood Applied Physics & Electrical Engineering Columbia University	Making Photonic Systems Ultracompact: Scaling Si for Lightwave Control
April 24, 2007 ^a	Ahmed H. Tewfik Electrical Engineering University of Minnesota	Biclustering and the Search for Group Biomarkers
April 27, 2007 ^b	Jeffrey Carruthers Electrical & Computer Engineering Boston University	Curriculum Review: EK307 Electric Circuit Theory
May 01, 2007 ^a	Joshua Semeter Electrical & Computer Engineering Boston University	Particle Acceleration in Space Plasmas: A Remote Sensing Perspective
May 14, 2007 ^a	Murat Alanyali Electrical & Computer Engineering Boston University	Power of Multiple Random Choices at the Server: An Asymptotic Analysis
May 15, 2007 ^a	Vaclav Kubecek Nuclear Sciences and Physical Engineering Czech Technical University	Diode Pumped Picosecond Solid State Lasers and Parametric Oscillators as Sensors of Intraresonator Phase Changes
May 15, 2007 ^a	Maja Bystrom Electrical & Computer Engineering Boston University	Including Human Factors in Signal Processing: Applications to Retrieval, Compression, and Interpretation
May 16, 2007	Paul Prucnal Electrical Engineering Princeton University	All-Optical Signal Processing Technologies for Network Applications

a ECE Colloquium Series

b Research Spotlight Seminar



4.10 Graduate Instructional Laboratories

Electronic Design Automation/VLSI Laboratory

The VLSI Instructional 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. *Herbordt, Hubbard, Kincaid, Knepper, Roziner, Taubin*

IMSIP Instructional Laboratory

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

Photonics Laboratory

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

RF Measurements Lab

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. *Knepper*



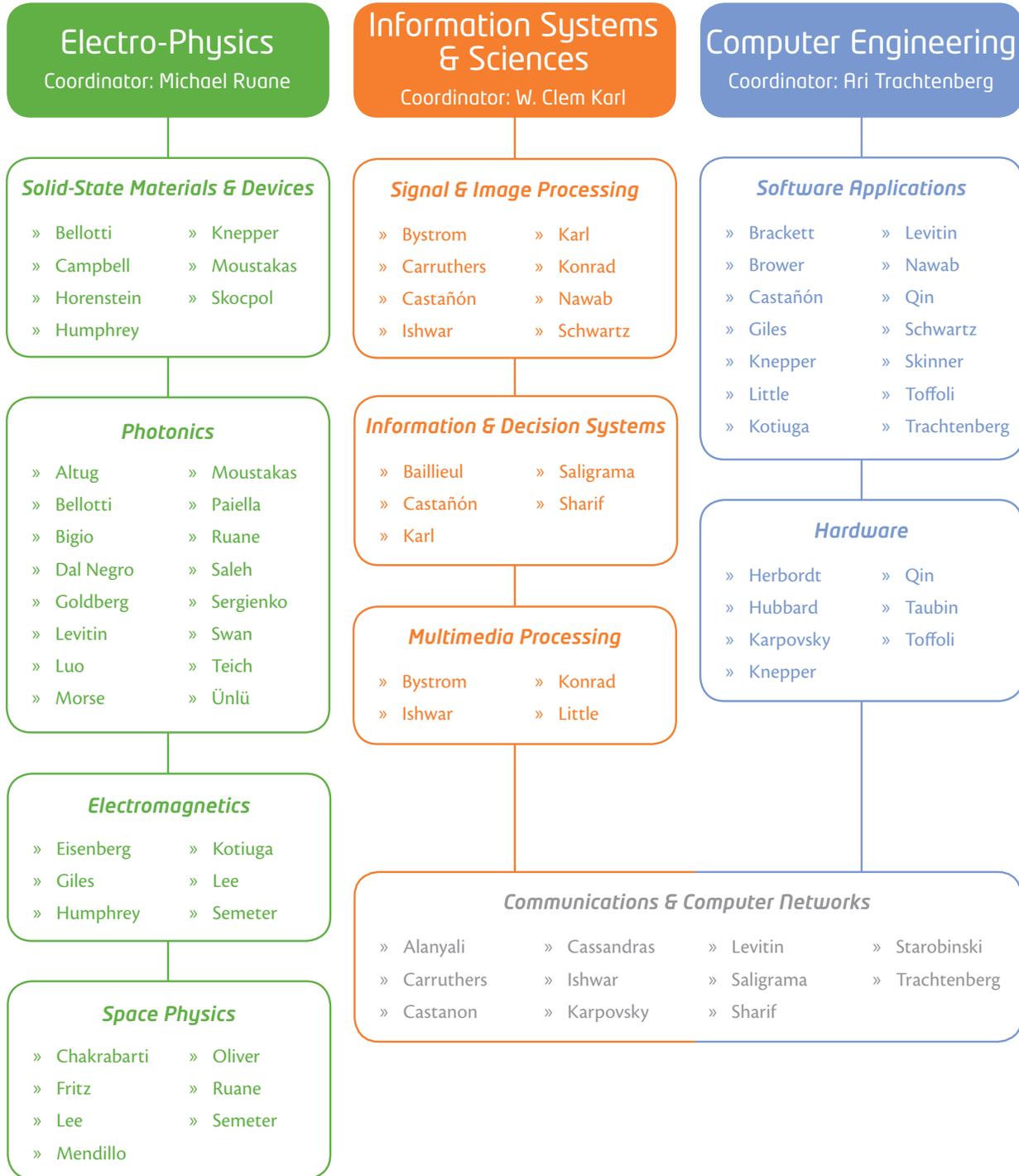
Signals and Networks (SIGNET) Laboratory

This laboratory provides instructional facilities for courses in the areas of signal processing and communication networks. This laboratory houses numerous workstations for digital signal processing, image processing, and various real-time applications covering the complete audio frequency spectrum. Equipment includes Linux-based workstations, microphones, DSP boards, speakers, amplifiers, 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. *Bystrom, Carruthers, Konrad, Nawab*

Software Engineering Laboratory

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 computerbased systems. The lab is comprised of more than twenty-five Silicon Graphics and Gateway 2000 networked workstations, plus four Motorola embedded computer development systems. The laboratory provides a network of workstations running Windows XP and provides students with state-of-the art development and modeling tools for the design, implementation and testing of distributed software systems. *Skinner, Brackett, Herbordt, Taubin, Toffoli, Trachtenberg*

5.1 Areas of Research



The ECE Department has three overlapping areas of research and instruction:

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

The following is a description of each of these areas, including its present needs and its envisioned future.

A. Electrophysics

Electrophysics encompasses several strong and emerging areas of electrical engineering, including photonics, solid-state materials and devices, electromagnetics, and space physics. The electrophysics faculty have strong campus collaborations with the Photonics Center, the Center for Nanoscience and Nanobiotechnology (CNN) and the Center for Space Physics, and play key roles in the NSF Engineering Research Center (ERC) for Subsurface Sensing and Imaging Systems (CenSSIS).

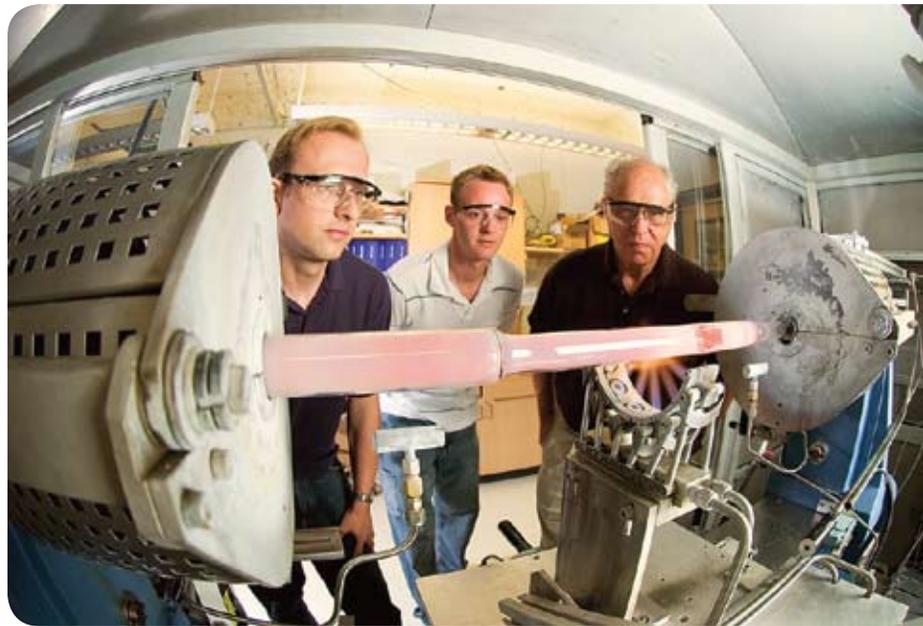
Photonics

Research in photonics includes: photonic materials, devices, and nanostructures; fiber-optic technology; optical imaging and microscopy; biophotonics and medical optics; and quantum optics:

Photonic Materials and Devices and Nanophotonics. Several ECE faculty pursue research in photonic materials and devices. **TED MOUSTAKAS** is pursuing groundbreaking research in photonic devices based on the wide band-gap semiconductors, including Blue, Green, and UV-LEDs, UV-LDs, Optical Modulators, and Detectors. He and **ROBERTO PAIELLA** are developing devices based on intersubband transitions such as quantum-cascade lasers. **LUCA DAL NEGRO**'s research is focused on steady-state optical spectroscopy, ultrafast emission spectroscopy, optical gain relaxation dynamics, and nonlinear optical characterization of semiconductor nanostructures and photonic and plasmonic nano-devices. He implements optical techniques including: photoluminescence, picosecond fluorescence lifetime spectroscopy, time-resolved variable stripe length and pump-probe gain techniques, emission quantum efficiency and photon statistics, Z-scan nonlinear characterization, and second harmonic generation (SHG). **HATICE ALTUG** is designing, fabricating and experimentally characterizing nanophotonic structures and nanoparticles that can control the light matter interaction. She is also developing state of the art nano-photonics devices such as ultrafast lasers, efficient light emitting diodes and slow light structures. The structures are important for the realization of a high bandwidth, high speed, low power and compact all-optical circuit. **ANNA SWAN** 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 Ray-

leigh scattering, interference techniques, resonant Raman scattering and photo luminescence. **BENNETT GOLDBERG** and **SELIM ÜNLÜ** 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.

Optical Fiber Technology. The Lightwave Technology lab led by **TED MORSE** is one of the few university laboratories capable of designing, fabricating, and characterizing silica optical fibers. The research activities of this laboratory focus on new processing techniques for optical fibers, high power optical fiber lasers, and a variety of optical fiber sensors. A new technique is being developed for combining multimode pump radiation into double clad fibers. The laboratory has a fabrication laboratory with three glass lathes including a new state-of-the-art Nextrom MCVD system and an 8m optical fiber draw tower, newly outfitted with Nextrom winding and control equipment.



Roman Shubochkin, Bob Chivas, and Professor Ted Morse observe the lathing process in the Laboratory for Lightwave Technology.

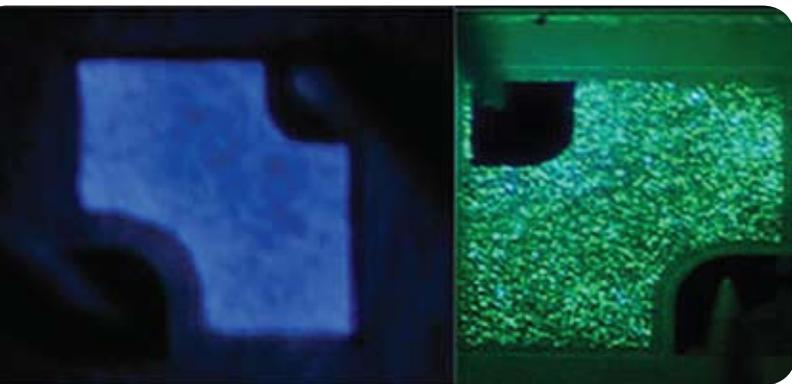
Biomedical Optics and Biophotonics. The central theme of **IRVING BIGIO**'s biomedical optics research is minimally-invasive optical diagnostics and therapeutics. His lab is developing a variety of optics-based technologies for clinical applications and biomedical research. Current projects include: advanced spectroscopic technologies for tissue diagnosis, noninvasive measurement of drug concentrations in tissue, interstitial laser thermotherapy and photodynamic therapy, optical sensing of internal cellular processes, optical methods for imaging of nerve activation, and analytical and computational methods for modeling photon transport in tissue. **BENNETT GOLDBERG** and **SELIM ÜNLÜ** develop resonant cavity enhanced photodetectors and imaging biosensors for DNA and protein

arrays. **HATICE ALTUG** uses photonic nanostructures to develop ultra-sensitive and compact sensors integrated on chip with microfluidic channels for proteomics and genomics applications. **LUCA DAL NEGRO** develops novel bio-compatible materials based on nanostructures. Michael Ruane has developed a novel optical device, the Resonant Cavity Imaging Biosensor, for tag-free bio-sensing and IR imaging; a mask-free optical synthesizer for bio-arrays is also being developed.

Quantum Information. Research in the Quantum Imaging Laboratory, directed by **BAHAA SALEH**, **ALEXANDER SERGIENKO**, and **MALVIN TEICH**, focuses on the enhancement of optical information processing by use of the unique properties of nonclassical light, particularly light in an entangled state. Nonlinear optical techniques, including parametric downconversion, are used to generate such light. Fundamental aspects of spatial, temporal, and polarization entanglement; coherence; and interferometry are addressed. Applications include microscopy, optical coherence tomography, metrology, as well as secure communication and networking via quantum key distribution. **LEV LEVITIN** and **TOM TOFFOLI** are investigating ultimate physical limits on the operation time of quantum gates, measures of conditional entropy and mutual information between quantum systems, certain paradoxes of quantum communication theory, and issues of energy dissipation in reversible computing.

Solid-State Materials & Devices

This area overlaps naturally with photonics and we have deliberately emphasized this connection in an effort to strengthen the photonics program while meeting our instructional needs in the semiconductor area. The most senior faculty member in this area, **TED MOUSTAKAS**, continues to lead a large research program in the more advanced family of Nitride Semiconductors, an area for which the group is recognized as one of the leading organizations in the world. The research is a combination of theoretical/modeling work in parallel with experimental studies of



Photographs of a blue and a green LED produced by professor Moustakas' lab

these advanced materials and corresponding devices. Intellectual Property derived from this work has been licensed by the University to major US and Japanese companies producing blue LEDs and blue lasers. Junior faculty member **ROBERTO PAIELLA** is involved applications of the nitrides to long-wavelength devices, including quantum cascade lasers, and **ENRICO BELLOTTI** pursues world class, and well funded, research in numerical modeling of semiconductor materials and devices. The group is funded

by DOE (for applications in solid state lighting), by DARPA and NASA (for the development of UV lasers and LEDs for identification of biological and chemical agents, by the Air Force (development of transistors for high power and high frequency applications) and by ARL (development of quantum cascade lasers). Fundamental work is supported by NSF, ONR and AFOSR-MURI. The group collaborates closely with members of the Physics Department. The most recent addition to this group is **LUCA DAL NEGRO**, who is developing a laboratory in silicon light sources.

Wide Band Gap Semiconductors. In the Wide Band Gap Semiconductors Laboratory, **TED MOUSTAKAS** 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 focus is in the development of Optical Devices, 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 **ENRICO BELLOTTI** in the area of theoretical modeling, **KARL LUDWIG** (Physics) in the area of materials structure, **KEVIN SMITH** (Physics) in the area of electronic structure, and **ROBERTO PAIELLA** in the area of devices based on intersubband transitions.

Computational Electronics. Led by **ENRICO BELLOTTI**, the Computational Electronics Group develops software to study semiconductor materials and to perform electronics and optoelectronics device simulation. Commercial simulation packages, such as ISE Genesis and Silvaco Virtual Wafer Fab are currently employed. The Computational Electronics Laboratory is equipped with state-of-the-art computing tools including two computer clusters, one XP1000 Alpha Cluster (8 CPUs) running True UNIX 64, and an AMD Athalon MP Cluster (13 CPUs) running Linux.

Electromagnetics & Space Physics

Electromagnetics. ECE faculty pursues research in various theoretical and applied aspects of electromagnetics. **MARK HORENSTEIN**'s research is devoted to problems in experimental electromagnetics with a primary focus on industrial electrostatics, sensors, and micro-electromechanical systems (MEMS). Current projects include a study of spark energies from insulating surfaces, studies of the electrostatic properties of insulating materials, development of a circular electrode array plasma-torch system, and charge-control systems for MEMS actuators. **ROBERT KOTIUGA**'s research centers about the difficulties encountered in the finite element analysis of three-dimensional electromagnetic fields that cannot be anticipated through experience with two-dimensional simulations. The lab has focused its efforts in the development of Whitney form techniques, homology calculations, algorithms for total magnetic scalar potentials in multiply connected regions, helicity functional techniques, and data structures based on semi-simplicial objects. Torsion invariants of complexes and rational homotopy theory are currently being exploited in the context of direct and inverse three-dimensional problems such as impedance tomography and magnetic field synthesis. **MIN-CHANG LEE** is conducting field experiments 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.

Space Physics. Several ECE faculty have maintained collaborations with the Boston University Center for Space Physics (CSP). **BILL OLIVER** and **JOSH SEMETER** are directly involved in atmospheric and remote sensing studies, and others are involved in signal processing applications (**DAVID CASTAÑÓN**, **CLEM KARL**, and **JANUSZ KONRAD**) and instrumentation (**ALLYN HUBBARD** and **MIKE RUANE**). **MICHAEL RUANE** and **JOSH SEMETER** are investigating miniature magnetometers based on Giant Magneto Impedance, and developing the motor controls for the Loss Cone Imager, which will fly on the USAF DSX satellite in 2009. Affiliate appointments for CSP/AST **TED FRITZ**, **MICHAEL MENDILLO**, and **SUPRIYA CHAKRABARTI** in the ECE Department have strengthened the collaboration and facilitated the involvement of ECE students in CSP projects in areas such as atmospheric studies using radio wave technology, remote sensing, and astronomical imaging. The recent addition of **JOSH SEMETER** to the ECE faculty has created a stronger link, and continued collaboration remains of mutual benefit to both units. Affiliated with CSP, the Imaging Science Laboratory, led by **MICHAEL MENDILLO** and **JOSH SEMETER**, 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.

B. Information Systems and Sciences

Research in ISS deals with the extraction, interpretation, visualization, processing, and communication of information. An important focus of this group involves the extraction of uncertain/incomplete information in physical as well as engineered systems. Applications include biomedical signal and image processing, remote sensing for atmospheric science, buried land mine detection, coding for communication systems, multimedia communication, distributed and mobile information processing, sensor networks, and advanced visual communication and entertainment. The group has an ongoing collaboration with the BME department and the Bio-Informatics program at BU. It has established strong collaborative efforts with MGH, and plays an important role in the Center for Subsurface Sensing and Imaging Systems. Research is supported by NSF, NIH, ONR, AFOSR, DARPA, as well as industry.

There are four primary research areas: Signal and Image Processing, Multimedia Processing, Information and Decision Systems, and Communications and Networks.

Signal and Image Processing

Signal and image processing encompasses the development and implementation of algorithms and means to analyze and extract information from signals obtained from observing a phenomenon. The original signals can be a variety of types arising in a multitude of applications, including speech, audio, still images, video, and remote sensing and telemetry data. Possible processing goals for such signals include transmission, display, storage, interpretation, classification, segmentation, or diagnosis. Research thrusts currently pursued by the ISS group include:

Computational Signal Processing. Research in computational signal processing (CSP) and its integration into application systems including auditory and biosignal processing is led by **HAMID NAWAB**. Issues of

interest include CSP algorithms, knowledge-based systems, software architectures for CSP systems, software environments for the development of CSP systems, integration of numeric and symbolic processing, statistical signal processing, and multidimensional signal processing.

Image Processing. Research in imaging processing is led by a number of faculty including **MAJA BYSTROM**, **DAVID CASTAÑÓN**, **PRAKASH ISHWAR**, **CLEM KARL** and **JANUSZ KONRAD**. Research thrusts include feature-enhanced imaging, geometric-based estimation, wavelet-based overcomplete representations, inverse problems under dynamic conditions, problems related to visual perception, sampling and quantization of visual data, image restoration and enhancement, image segmentation, image recognition, and image transmission and storage (compression, watermarking, authentication, etc.).

Statistical Signal Processing. This area focuses on the efficient and robust extraction of information from diverse sources in the face of uncertain data and models using a statistical approach. Research of several ECE faculty, including **DAVID CASTAÑÓN**, **CLEM KARL**, **VENKATESH SALIGRAMA**, and **PRAKASH ISHWAR**, is based on the development of statistical models for both observations and prior knowledge, and the subsequent use of these models for optimal or near-optimal processing. Fundamental issues such as understanding the structure of very high dimensional and multiresolution data through information-theoretic methods are pursued. Some unifying principles tying the set-theoretic and maximum-entropy approaches to modeling and estimation have been uncovered. Applications that motivate this research include 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).

Biological and Medical Signal Processing. The creation of new ways to probe biological media is providing researchers with unprecedented data concerning a range of biological phenomenon, ranging from the molecular to the clinical. The objective of research in this area conducted by **CLEM KARL** in collaboration with MGH is to develop new methods of signal and image processing to robustly separate signal from noise. Probing modalities include optical and fluorescence microscopy, computed tomography, ultrasound, MRI, dynamic PET & SPECT. Applications include: molecular imaging, brain imaging; dynamic imaging; interventional imaging. Also, **HAMID NAWAB** collaborates with the Center for Neuromuscular Research on problems of biosignal separation and identification.

Multimedia Processing

Research in multimedia processing concentrates on issues related to the modeling of multimedia signals (e.g., image sequences, video, music, speech, and their combinations). Current research activity centers primarily on visual information and multimedia transmission. A wide range of interesting topics are investigated, with the main focus on multidimensional signal modeling, motion modeling, estimation and segmentation, video compression and transmission, watermarking and authentication, 3-D multimedia systems design. Applications that motivate this research are primarily encountered in video surveillance, video compression for various new services (Internet, cellular and wireless), new human-computer interfaces (3-D), next-generation multimedia services, etc.

Visual Information Processing. Research in this area, led by **JANUSZ KONRAD**, includes manipulation, compression, transmission and

retrieval of visual information, whether in the form of still images, video sequences, or multimedia data. In addition to standard monoscopic (2-D) images, also stereoscopic and multiscope (3-D) images are studied. In this thrust, advanced solutions are sought to such challenges as enhancement, segmentation (moving object extraction) and compression of image sequences. One particular video characteristic that is exploited is the temporal coherence of visual data along motion trajectories; various video processing and compression methods are being developed by jointly processing the visual data in spatial (horizontal and vertical) and temporal coordinates. The primary application of this research is in the next generation multimedia communications: life-like (3-D), efficient (low bit rate), reliable (error-resilient), and flexible (object-based). Facilities for visualization infrastructure include 2-D and 3-D digital cameras and capture systems, as well as 3-D displays (shuttered and 9-view automultiscopic "Synthagram").

Multimedia Transmission. Multimedia transmission is a new and rapidly growing field concerned with all aspects of processing and manipulating multimedia data for transmission and storage. Fundamental issues in this area, pursued by **MAJA BYSTROM**, **PRAKASH ISHWAR**, and **JANUSZ KONRAD**, include data compression, preprocessing, interaction with physical transmission storage elements, and post-processing such as voice or video restoration. Bystrom's work is focused on joint source-channel coding/decoding of images and video and on resource allocation in multimedia systems. Applications range from video-on-demand consumer services to ad hoc network design to medical data storage, transmission, and access. Ishwar has been focusing on distributed signal processing and multiuser information theory motivated by new challenging problems and emerging applications in sensor networks, multimedia-over-wireless, and information security. This includes ongoing work on distributed sampling, resource-constrained distributed inference in unreliable sensor networks, and distributed video coding where his efforts are contributing to uncover fundamental performance limits and guide the development of new coding architectures and constructive algorithms.

Information and Decision Systems

Research in information and decision systems spans a variety of topics, including robust signal processing that deals with developing statistical modeling and processing techniques for limited informational contexts, distributed and networked signal processing to deal with noisy distributed information from multiple sources that must be fused under communication constraints, as well as control and decision theory.

Research in these areas straddles a wide variety of applications ranging from mobile communications, echo-cancellation, sensor networks, sensor array processing, and image processing. The goals of the research is twofold: 1) understand fundamental limits to achievable quality of information; and 2) develop general as well as application specific algorithms. Faculty involved in this area include **DAVID CASTAÑÓN**, **VENKATESH SALIGRAMA**, and **PRAKASH ISHWAR**.

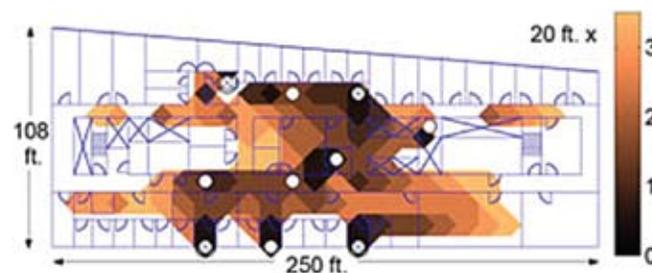
Communications and Networks

This area deals with digital communications theory and applications, wireless infrared and broadband communications, scalability, heterogene-

ity, and performance of networks.

Broadband Wireless Communications. **JEFFERY CARRUTHERS** leads 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. His laboratory includes facilities for the fabrication and testing of experimental prototypes as well as computing resources for system design and analysis.

Networking and Information Systems. **DAVID STAROBINSKI** and **ARI TRACHTENBERG** are involved in providing novel perspectives on modern networking issues, including scalability, heterogeneity, and performance. Their laboratory of Networking and Information Systems is equipped with sophisticated hardware and software and promotes re-



An image depicting the resolution of SensorNet Architectures for Indoor Location Detection

search into the fields of network synchronization, mobile computing, Internet traffic engineering, distributed Web caching, and coding theoretic approaches to real-time information reconciliation.

Networked/Distributed Signal Processing. **VENKATESH SALIGRAMA** is developing tools for a fundamental system-level framework for networked decision making in uncertain environments. While significant effort over the last decade in sensor development, physical layer transmission and networking has laid the initial groundwork for practical deployment, the full potential for networked sensing systems can only be realized through a fundamental understanding of decision-making in networked and uncertain environments. He is modeling communications and networking constraints at a systems level and developing distributed methods for group of decision agents to reliably detect, localize, and track relevant dynamic and uncertain events. Additionally, he aims at understanding fundamental limitations of large-scale wireless networks in terms of throughput, delay and stability.

C. Computer Systems Engineering

Research in computer systems engineering is pursued in areas including gate- and chip-and circuit-level systems, embedded systems, computer architecture and automated design, fault-tolerant and reliable computing, distributed and network computing, multimedia applications, and high-performance computing.

VLSI

The VLSI group led by **ALLYN HUBBARD** designs, builds, and tests chips in innovative architectures that span a wide variety of VLSI applica-

tions. Chips designed using digital, analog, and subthreshold methodologies are realized using CMOS, BiCMOS, and Bipolar technologies. Applications include neural-net image processing, integrated photonic devices and parallel photonic testing, automatic partial-valued dynamic logic synthesis, single-chip large-molecule and DNA analyzers, and neural tissue interface chips. The group is equipped with a full suite of design tools and testing instrumentation for analog and digital systems.

Embedded Systems

Research in embedded systems led by **WEI QIN** 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.

Asynchronous Circuits

Research activities in the design of asynchronous systems pursued by **ALEXANDER TAUBIN** include analysis, synthesis, testing, formal verification, and architectural design.

Computer Architecture and Automated Design

Research in this area led by **MARTIN HERBORDT** focuses on experimental computer architecture, particularly on the application of emerging technology to computationally intensive application. Projects include developing design tools for application specific coprocessors, designing MPP router switches, vision computers, and the application of configurable computing to bioinformatics.

Testing, Reliable, and Secure Computing

MARK KARPOVSKY and **LEV LEVITIN** conduct research on efficient hardware testing at the chip, board, and system levels, functional software testing, fault-tolerant message routing for multiprocessor systems, and the design of reliable computer networks. **ALEXANDER TAUBIN** also active in research in architectures based on asynchronous circuits for computer security and side-channel attacks resistance.

Distributed and Multimedia Applications

Research in this area led by **TOM LITTLE** includes investigation of distributed modes interaction among wireless computers; aggregation and clustering techniques for scaling large-scale Mobile Ad Hoc Networks (MANETs) and Sensor Networks; communication systems for continuous media; and conceptual and physical database organizations. His laboratory is equipped with a high-performance simulation environment and a wireless testbed for proof-of-concept prototype development.

Network Computing

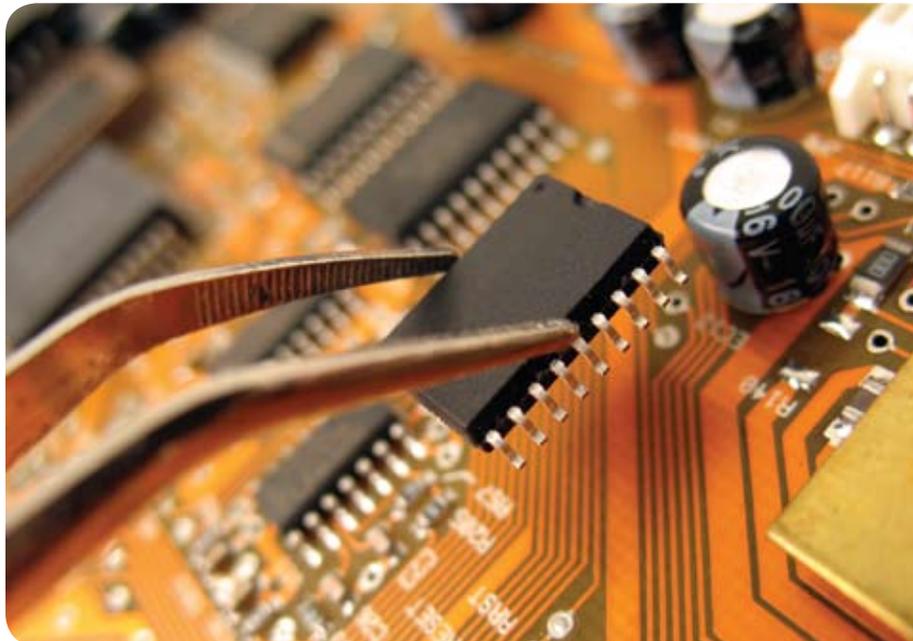
Research in network computing led by **MARK KARPOVSKY** focuses on interconnection network topologies; routing, network flow control, and deadlocks in multicomputer networks; multicast and broadcast, fault-tolerance in interconnection networks; modules for realization (nodes and routers); performance metrics and scalability; message passing interference, protocols and programming, scalable coherent interface (SCI), and distributed shared memory; network of workstations (NOW), case studies of high performance scalable networks, and cluster computing.

High-Performance Computing

The use of high-performance parallel computers to solve problems in physics, materials science, and engineering systems is pursued by a number of ECE faculty using the resources of the BU Center for Computational Science. **RICHARD BROWER** works on molecular dynamics simulation for biomolecules, lattice methods for statistical mechanics and quantum field theory of strings and particles. **ROSCOE GILES'** research developed algorithms for large-scale micromagnetic modeling and molecular dynamic simulation.

Knowledge Engineering

TOM TOFFOLI is pioneering research in Knowledge Engineering on a personal scale. He addresses issues such as concepts and tools individuals need in order to acquire, structure, and activate knowledge for their own sake—not just as operators of their employer's information-processing machinery—in research, business, personal life, authoring, presence on the Internet, etc.



5.2 Centers & Interdisciplinary Activities

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 Ph.D. 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 some of the following 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, opto-electronics, 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 manmade structures. CenSSIS is a collabora-

tive effort of 4 academic institutions: Boston University, Northeastern University, Rensselaer Polytechnic Institute, and the University of Puerto Rico at Mayagüez; and 4 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 the 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, but it is spread across departments, colleges and schools within the University. 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 for Information and Systems Engineering 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 2005, CISE has grown from 13 to 26 affiliated faculty from the Departments of Manufacturing Engineering, Aerospace & Mechanical Engineering, and Electrical & Computer Engineering in the College of Engineering; the Department 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 60 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 and Computer Engineering Department faculty affiliated with CISE are Professors Alanyali, Baillieul, Carruthers, Cassandras, Castañón, Ishwar, Karl, Little, Saligrama, Sharif, 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. Professor David Castañón is currently serving as Co-Director along with Professor Yannis Paschalidis of the Department of Manufacturing Engineering. 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

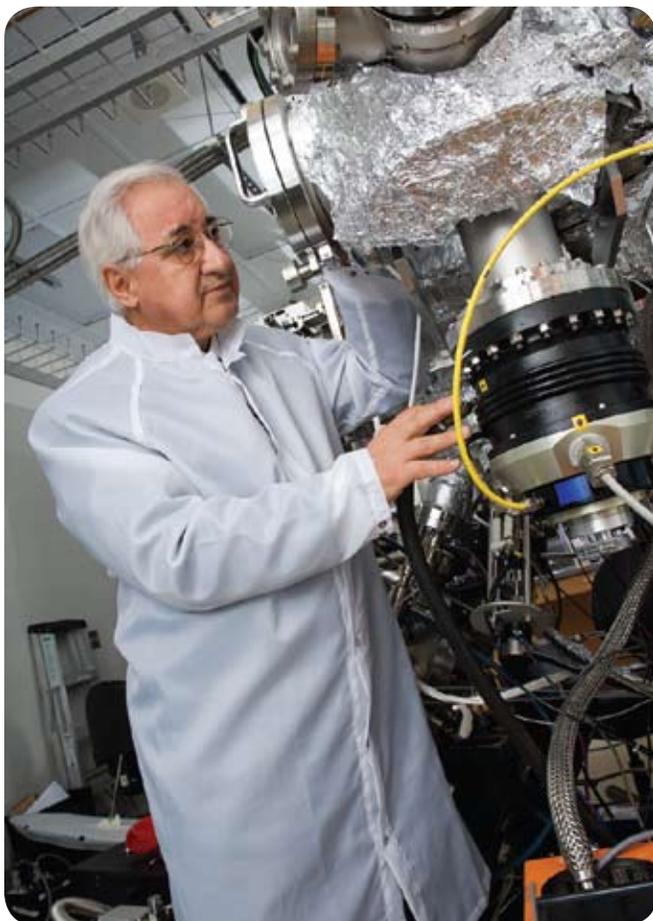
<http://nanoscience.bu.edu/>

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.



Professor Theodore Moustakas

5.3 Publications

Books:

A. Mendez and **T.F. MORSE**, Editors, *Specialty Optical Fibers Handbook*. Boston: Academic Press, 2006.

B. E. A. SALEH and **M. C. TEICH**, *Fundamentals of Photonics*, First Edition. (Japanese Translation). Wiley, 2006.

B. E. A. SALEH and **M. C. TEICH**, *Fundamentals of Photonics*, Second Edition. Wiley, 2007.

Book Chapters:

O. Savas, **M. ALANYALI** and **V. SALIGRAMA**, "Efficient In-Network Processing Through Information Coalescence," in *Lecture Notes in Computer Science*, vol. 4026, Springer, 2006.

E. BELLOTTI and F. Bertazzi, "Transport Parameters for Electrons and Holes," in *Nitride Semiconductor Devices: Principles and Simulation*, Joachim Piprek, ed., Wiley, March 2007.

S. Gunna, F. Bertazzi, **R. PAIELLA** and **E. BELLOTTI**, "Intersubband Absorption in AlGaIn/GaN Quantum Wells," in *Nitride Semiconductor Devices: Principles and Simulation*, Joachim Piprek, ed., Wiley, March 2007.

L.C. Kimerling, **L. DAL NEGRO**, M. Stolfi, J. H. Yi, J. Michel and X. Duan, E. H. Sargent, T.-W. F. Chang, V. Sukhovatkin, J. Haavisto and J. LeBlanc, "Si-rich Dielectrics for Active Photonic Devices" in *Device Applications of Silicon Nanocrystals and Nanostructures*, N. Koshida, ed., Springer-Verlag, Berlin, 2007.

G.D. Bustard, D.C. Mountain and **A.E. HUBBARD**, "A 3D finite element model of the gerbil cochlea," in *Auditory Mechanisms: Processes and Models*, A.L. Nuttall, ed., World Scientific, 2006.

F. Chen, H.I. Cohen, D.C. Mountain, A. Zosuls and **A.E. HUBBARD**, "A Hydro-Mechanical Biomimetic Cochlea: Experiments and Models," in *Auditory Mechanisms: Processes and Models*, A.L. Nuttall, ed., World Scientific, Singapore, 2006.

A. E. HUBBARD, S. Lu, J. Spisak and D.C. Mountain, "The evolution of multi-compartment cochlear models," in *Auditory Mechanisms: Processes and Models*, A.L. Nuttall, ed., World Scientific, Singapore, 2006.

S. Lu, J. Spisak, D.C. Mountain and **A.E. HUBBARD**, "A New Multicompartment Model of the Cochlea," in *Auditory Mechanisms: Processes and Models*, A.L. Nuttall, ed., World Scientific, Singapore, 2006.

D.C. Mountain and **A.E. HUBBARD**, "What Stimulates the Inner Hair Cells?," in *Auditory Mechanisms: Processes and Models*, A.L. Nuttall, ed., World Scientific, Singapore, 2006.

G.Gaubatz, B.Sunar and **M.G.KARPOVSKY**, "Non-Linear Residue Codes for Robust Public-Key Arithmetic", in *Lecture Notes in Computer Science: Fault Diagnosis in Cryptography*, vol. 4326/2006, Springer, 2006.

K. Kulikowski, **M. G. KARPOVSKY**, and **A. TAUBIN**, "DPA on Faulty Cryptographic Hardware and Countermeasures," in *Fault Diagnostic and Tolerance in Cryptography*, Springer, September 2006.

K. Kulikowski, **M.G. KARPOVSKY** and **A. TAUBIN**, "Fault Attack Resistant Cryptographic Hardware with Attack Independent Uniform Error Detection," in *Fault Diagnostic and Tolerance in Cryptography*, Springer, September 2006.

D.DiGiovanni, R. Shubochkin and **T.F. MORSE**, and B. Lenardic, "Fiber Lasers" in *Specialty Optical Fibers Handbook*, A. Mendez and **T.F. MORSE**, eds., Academic Press, 2006.

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," in *Biophotonics*, L. Pavesi and P. Faucher, eds., Springer and Verlag, 2007.

N. Devroye, P. Mitran, **M. SHARIF**, and V. Tarokh, "Information-theoretic Analysis of Cognitive Radio Systems," in *Cognitive Wireless Communications Networks*, Springer, June 2007.

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," in *Biophotonics*, L. Pavesi and P. Faucher, eds., Springer and Verlag, 2007.

K.J. Kulikowski, A. Smirnov, and **A. TAUBIN**, "Automated Design of Cryptographic Devices Resistant to Multiple Side-Channel Attacks," in *Cryptographic Hardware and Embedded Systems - CHES 2006*, Springer, September 2006.

T. TOFFOLI, "Foreword," *Quantum Information: An Overview*, Gregg Jaeger, Springer, 2006.

Journal Articles

A. Al Daoud and **M. ALANYALI**, "Loss-Cognizant Pricing in Networks with Greedy Users," *Computer Networks*, vol. 51, no. 6, pp. 1660-1683, April 2007.

E. Ermis, **M. ALANYALI** and **V. SALIGRAMA**, "Search and discovery in an uncertain networked world," *IEEE Signal Processing Magazine*, vol. 23, no. 4, pp. 107-118, July 2006.

V. SALIGRAMA, **M. ALANYALI** and O. Savas, "Asynchronous Distributed Detection in Sensor Networks," *IEEE Transactions on Signal Processing*, 54 (11), pp. 4118-4132, November 2006.

V. SALIGRAMA, **M. ALANYALI** AND O. Savas, "Distributed Detection in Sensor Networks with Finite Capacity Links and Packet Losses," *IEEE Transactions on Signal Processing*, Volume: 54, Issue: 11, pp. 4118- 4132, 2006.

H. ALTUG, D. Englund and J. Vuckovic, "Ultra-fast Photonic Crystal Nanocavity Laser," *Nature Physics*, 2, 484-488, 2006.

V. Camarchia, **E. BELLOTTI**, M. Goano and G. Ghione, "GaN Permeable Base Transistors for Microwave Power Applications," *Semiconductor Science and Technology*, 21, p.13-18, 2006.

GL Kelloff, **I.J. BIGIO** et al., "Imaging Science Development for Cancer Prevention and Preemption", invited review, *Cancer Biomarkers* (2007, in press).

Jean Luc Castagner and **I.J. BIGIO**, "Particle sizing with a fast polar nephelometer," invited review, *Applied Optics* 46, 527-532 (Feb. 2007).

I.J. BIGIO and SK Singh, "Will the practice of GI cancer surveillance be revised by the advent of optical sensing?" Invited editorial, *Clinical Cancer Research*, (2007, in press).

H. Fang, L. Qiu, E. Vitkin, M.M. Zaman, C. Andersson, S. Salahuddin, L.M. Kierer, P.B. Cipolloni, M.D. Modell, B.S. Turner, S.E. Keate, **I.J. BIGIO**, I. Itzkan, S.D. Freedman, R. Bansil, E.B. Hanlon and L.T. Perelman, "Confocal Light Absorption and Scattering Spectroscopic Microscopy," *Applied Optics* 46, 1760-1769, 1 April 2007.

A. Kopansky and **M. BYSTROM**, "Detection of Aperiodically Embedded Synchronization Patterns on Rayleigh Fading Channels," *IEEE Transactions on Communications*, vol. 54, no. 11, pp. 1928-1932, November 2006.

L. DAL NEGRO, J.H. Yi, J. Michel, L.C. Kimerling, S. Hamel, A. Williamson and G. Galli, "Light emitting silicon nanocrystals and photonic structures in silicon nitride," *IEEE Journal of Selected topics in Quantum Electronics*, *Silicon Photonics*, vol 12, no 6, pg. 1628, November 2006.

L. DAL NEGRO, J.H. Yi, J. Michel, L.C. Kimerling, T.W.F. Chang, V. Sukhovatkin and E.H. Sargent, "Light Emission Efficiency and Dynamics in Silicon-rich Silicon nitride films," *Applied Physics Letters*, 88, 233109, 2006.

L. DAL NEGRO, S. Hamel, N. Zaitseva, J.H.Yi, A. Williamson, M. Stolfi, J. Michel, G. Galli and L.C. Kimerling, "Synthesis, characterization and modeling of colloidal and thin-film silicon nanocrystals," *IEEE Journal of Selected topics in Quantum Electronics*, *Nanophotonics*, vol 12, no 6, pg. 1151, December 2006.

L. DAL NEGRO, Y.H. Yi, M. Hiltunen, J. Michel, L.C. Kimerling, S. Hamel, A. Williamson, G. Galli, T.D.F. Chang, V. Sukhovatkin and E.H. Sargent, "Light emitting silicon-rich nitride systems and photonic structures," *Journal of Experiment Nanoscience*, vol. 1, 1-21, 2006.

M.C. HERBORDT, T. VanCourt, Y. Gu, B. Shkhwani, A. Conti, J. Model and

Publications (cont.)

- D. DiSabello, "Achieving High Performance with FPGA-Based Computing," *IEEE Computer*, 40 (3), pp. 50-57, 2007.
- T. VanCourt and **M.C. HERBORDT**, "Families of FPGA Accelerators for Approximate String Matching," *Microprocessors and Microsystems*, 31 (2), pp. 135-145, 2007.
- T. VanCourt, Y. Gu, V. Mundada and **M.C. HERBORDT** "Rigid Molecule Docking: FPGA Reconfiguration for Alternative Force Laws," *Journal of Applied Signal Processing*, v2006, pp. 1-10, 2006.
- Y. Gu, T. VanCourt and **M.C. HERBORDT**, "Accelerating Molecular Dynamics Simulations with Configurable Circuits," *IEE Proceedings on Computers and Digital Technology*, 153 (3), pp. 189-195, 2006.
- F. Chen, H. Cohen, T. Bifano, J. Castle, J. Fortin, C. Kapusta, D. Mountain, A. Zosuls and **A. HUBBARD**, "A hydromechanical biomimetic cochlea: Experiments and models," *Journal of the Acoustical Society of America*, 119(1), 394-405, 2006.
- R. Puri, A. Majumdar, **P. ISHWAR** and K. Ramchandran, "Distributed Video Coding in Broadband Wireless Sensor Networks," *IEEE Signal Processing Magazine*, vol. 23, no. 4, pp. 94-106, July 2006.
- K.J. Kulikowski, **M.G. KARPOVSKY** and **A. TAUBIN**, "Robust Codes and Robust, Fault Tolerant Architectures of the Advanced Encryption Standard," *Journal of Systems Architecture*, Volume 53, Issues 2-3 pp.139-149, 2007.
- L. B. LEVITIN, M. KARPOVSKY** and M. Mustafa, "A new algorithm for finding minimal cycle-breaking sets of turns in a graph," *Journal of Graph Algorithms and Applications*, 10, no.2, 387-420, 2006.
- J. KONRAD**, "Videopsy: Dissecting visual data in space-time," *IEEE Communications Magazine*, vol. 45, pp. 34-42, January 2007.
- L. Oddsson, R. Karlsson, **J. KONRAD**, S. Ince, S. Williams and E. Zemkova, "A rehabilitation tool for functional balance using altered gravity and virtual reality," *Journal of NeuroEngineering and Rehabilitation*, 4:25, doi:10.1186/1743-0003-4-25, 2007.
- P. McNerney, **J. KONRAD** and M. Betke, "Block-based MAP disparity estimation under alpha-channel constraints," *IEEE Transactions on Circuits and Systems for Video Technology*, Volume: 17, Issue: 6, pp. 785-789, 2007.
- P. R. KOTIUGA**, "Weitzenbock Identities and Variational Formulations in Nanophotonics and Micromagnetics," *IEEE Transactions on Magnetism*, Vol. 43, (4), pp1669-1672, April 2007.
- A. Labno, R. Pradipta, **M.C. LEE**, M.P. Sulzer, L.M. Burton, J.A. Cohen, S.P. Kuo and D.L. Rokusek, "Whistlermode wave interactions with ionospheric plasmas over Arecibo," *Journal of Geophysical Research*, 112, A03306, doi:10.1029/2006JA012089, 2007.
- R. Pradipta, A. Labno, **M.C. LEE**, W.J. Burke, M.P. Sulzer, J.A. Cohen, L.M. Burton, S.P. Kuo and D.L. Rokusek, "Electron precipitation from the inner radiation belt above Arecibo," *Geophysical Research Letters*, 34, L08101, doi:10.1029/2007GL029807, 2007.
- N. Li, F. Luo, **S. UNLU, T.F. MORSE**, J. Hernandez-Cordero, J. Battiato and D. Wang, "Intra-cavity fiber laser technique for high accuracy birefringence measurements", *Optics Express*, Vol. 14, Issue 17, pp. 7594-7603, November 2006.
- A.S. Ozcan, Y. Wang, K.F. Ludwig, G. Ozaydin, A. Bhattacharyya, **T.D. MOUSTAKAS** and D.P. Siddon, "Real-Time X-ray Studies of Gallium Adsorption and Desorption," *Journal of Applied Physics*, 100, 084307, 2006.
- A. D. Williams and **T. D. MOUSTAKAS**, "Planarization of GaN by the etch-back method" *Materials Research Society Symposium Proceedings*, Vol. 892, 363, 2006.
- A. Williams and **T. D. MOUSTAKAS**, "Formation of large-area freestanding Gallium Nitride substrates by natural stress-induced separation of GaN and sapphire," *Journal of Crystal Growth*, Volume 300, Issue 1, Pages 37-41, 1 March 2007.
- J.C. Cabalu, A. Bhattacharyya, C. Thomidis **T.D. MOUSTAKAS** and C.J. Collins "High power ultraviolet light emitting diodes based on GaN/AlGaIn quantum wells produced by molecular beam epitaxy," *Journal of Applied Physics*, 100, 104506, 2006.
- J.S. Cabalu, A.D. Williams, T.P.Chen, R. France and **T.D. MOUSTAKAS**, "Visible Light Emitting Diodes Grown by Plasma-assisted MBE on Hydride vapor-phase epitaxy GaN templates and the development of dichromic (Phosphorless) white LEDs," *Material Research Society Symposium Proceedings*, Vol. 892, 245, 2006.
- L. Colakerol, P.A. Glans, L. Plucinski, Y. Zhang, K.E. Smith, A.A. Zakharov, R.Nyholm, J. Cabalu and **T.D. MOUSTAKAS**, "Resonant Photoemission at the Ga 3p photothreshold in In_xGa_{1-x}N," *Journal of Electron Spectroscopy and Related Phenomena*, 152, 25, 2006.
- L. Colakerol, T.D. Veal, H.K. Jeong, L. Plukinski, A. DeMasi, S. Wang, Y. Zhang, L.F.J. Piper, P.H. Jefferson, A. Fedorov, T.C. Chen, **T. D. MOUSTAKAS**, C.F. McConville and K.E. Smith, "Quantized Electron Accumulation States in Indium Nitride," *Physical Review Letters*, 97, 237601, 2006.
- L. Plucinski, L. Colakerol, S. Bernardis, Y. Zhang, S. Wang, C.O'Donnell, K.E. Smith, I. Friel and **T.D. MOUSTAKAS**, "Photoemission Study of Sulfur and Oxygen Adsorption on GaN (0001)," *Surface Science*, 600, 116, 2006.
- L. Zhou, T. Xu, D.J. Smith and **T.D. MOUSTAKAS**, "Growth and Characterization of relaxed InN quantum dots grown on GaN buffer layers by Molecular Beam Epitaxy," *Applied Physics Letters*, 231906, 88, 2006.
- R. Chandrasekaran, A.S. Ozcan, D. Deniz, K.F. Ludwig and **T.D. MOUSTAKAS**, "Growth of non-polar (11-20) and semi-polar (11-26) AlN and GaN

- films on the R-plane sapphire" *Physica Status Solidi (c)* 4, No.5, 1689-1693, 2007.
- R. France, T. Xu, P. Chen, R. Chandrasekaran and **T.D. MOUSTAKAS**, "Vanadium-based Ohmic contacts to n-AlGaIn in the entire alloy composition," *Applied Physics Letters*, 90, 062115, 2007.
- S. Basu, M.W. Barsoum, A.D. Williams and **T.D. MOUSTAKAS**, "Spherical Nanoindentation and Deformation Mechanism in Free-standing GaN Films," *Journal of Applied Physics*, 101, 083522, 2007.
- T. Xu, A. Nikiforov, R. France, C. Thomidis, A. Williams and **T.D. MOUSTAKAS**, "Blue-Green-Red LEDs based on InGaIn Quantum Dots (QDs) grown by molecular beam epitaxy," *Physica Status Solidi (a)* 204, No. 6, 2098, 2007.
- T. Xu, A. Nikiforov, R. France, C. Thomidis, A. Williams, **T.D. MOUSTAKAS**, L. Zhou and D.J. Smith, "Blue-green-red LEDs based on InGaIn Quantum dots by plasma-assisted MBE using GaN QDs for dislocation filtering" In *advances of III-V Nitride Semiconductor Material and Devices*, C.R. Abernathy, H. Jiang, J.M. Zavada, eds., Materials Research Society Symposium Proceedings, Paper No. 0955-105-05.
- Y. Wang, A. Özcan, G. Özyaydin, K. Ludwig Jr, A. Bhattacharyya, **T.D. MOUSTAKAS**, H. Zhou, R. Headrick and D. P. Siddons, "Real time synchrotron x-ray studies of low and high temperature nitridation of c-plane sapphire," *Physical Review B*, 74, 235304, 2006.
- Y. Li, A. Bhattacharyya, C. Thomidis, **T.D. MOUSTAKAS** and **R. PAIELLA**, "Nonlinear Optical Waveguides Based on Near-Infrared Intersubband Transitions in GaN/AlIn Quantum Wells," *Opt. Express*, vol. 15, pp. 5860-5865, April 2007.
- C.J. De Luca, A. Adam, R. Wotiz, L.D. Gilmore and **S.H. NAWAB**, "Decomposition of Surface EMG Signals," *Journal of Neurophysiology*, 96, 1646-1657, September 2006.
- M.J. Nicolls, N. Aponte, S.A. Gonzalez, M.P. Sulzer and **W.L. OLIVER**, "Daytime F-region ion energy balance at Arecibo for moderate to high solar flux conditions," *Journal of Geophysical Research*, 111, A10307, doi:10.1029/2006JA011664, October 2006.
- N. Balan, S. Kawamura, T. Nakamura, M. Yamamoto, S. Fukao, **W. L. OLIVER**, M.E. Hagan, A.D. Aylward and H. Alleyne, "Simultaneous MLT and thermospheric F region observations using MU radar," *Journal of Geophysical Research*, 111, A10517, doi:10.1029/2005JA011487, September 2006.
- M.D. Zettergren, **W.L. OLIVER**, P.L. Blelly and D. Alcayde, "Modeling the behavior of hot O⁺ ions," *Annales Geophysicae*, 24, 1625- 1637, July 2006.
- K. Driscoll and **R. PAIELLA**, "Silicon-Based Injection Lasers Using Electronic Intersubband Transitions in the L Valleys," *Applied Physics Letters*, vol. 89, art. no. 191110, 2006.
- Y. Li and **R. PAIELLA**, "Intersubband All-Optical Switching Based on Coulomb-Induced Optical Nonlinearities in GaN/AlGaIn Coupled Quantum Wells," *Semiconductor Science and Technology*, vol. 21, pp. 1105-1110, 2006.
- I. PASCHALIDIS**, W. Lai and D. Starobinski, "Asymptotically Optimal Transmission Policies for Large-Scale Low-Power Wireless Sensor Networks," *IEEE/ACM Transactions on Networking*, Vol. 15, No. 1, pp. 105-118, February 2007.
- X. Zhu, **W. QIN** and S. Malik, "Modeling Operation and Microarchitecture Concurrency for Communication Architectures with Application to Re-targetable Simulation," *IEEE Transactions on Very Large Scale Integration Systems*, Vol. 7, No. 14, July 2006.
- A.F. Abouraddy, T. Yarnall, **B.E.A. SALEH** and **M.C. TEICH**, "Violation of Bell's Inequality with Continuous Spatial Variables," *Physics Review A* 75, 052114, May 2007.
- H. Guillet de Chatellus, **A. V. SERGIENKO**, **B.E.A. SALEH**, **M.C. TEICH** and G. Di Giuseppe, "Non-collinear and Non-Degenerate Polarization-Entangled Photon Generation via Concurrent Type-I Parametric Downconversion in PPLN," *Opt. Express* 14, 10060-10072, October 2006.
- M. C. Booth, **B. E. A. SALEH**, **A. V. SERGIENKO**, and **M. C. TEICH**, "Temperature- and Wavelength-Dependence of Fermi-Tail Photoemission and Two-Photon Photoemission from Multi-alkali Semiconductors," *Journal of Applied Physics*, .100, 023521, July 2006.
- S. Carrasco, **B.E.A. SALEH**, **M.C. TEICH** and J.T. Fourkas, "Second- and Third-Harmonic Generation with Vector Gaussian Beams," *Journal of the Optical Society of America B* 23, 2134-2141, October 2006.
- J. SEMETER** and E.M. Blixt, "Evidence for Alfvén wave dispersion identified in high-resolution auroral imagery," *Geophysical Research Letters*, 33, L13106, doi:10.1029/2006GL026274, July 2006.
- F.A. Bovino, G. Castagnoli, A. Ekert, P. Horodecki, C. Moura Alves and **A.V. SERGIENKO**, "Direct Measurement of Bipartite Quantum States," *Open Systems & Information Dynamics*, v. 13, 281-289, 2006.
- M. SHARIF** and B. Hassibi, "A Comparison of time-sharing, beamforming, and DPC for MIMO broadcast channels with many users," *IEEE Transactions on Communications*, vol. 55, no. 1, January 2007.
- S. Ray and **D. STAROBINSKI**, "On False Blocking in RTS/CTS-based Multi-hop Wireless Networks," *IEEE Transactions on Vehicular Technology*, Vol. 56, No. 2, pp. 849-862, March 2007.
- A.N. Vamvakas A. Walsh, Y. Yin, **M.S. ÜNLÜ**, B.B. Goldberg and **A.K. SWAN**, "Exciton Mediated One Phonon Resonant Raman Scattering from one-Dimensional Systems," *Physical Review B*, Vol. 74, No. 20, pp. 205405, 3 November 2006.

Publications (cont.)

A.G. Walsh, A.N. Vamivakas, Y. Yin, S.B. Cronin, **M.S. ÜNLÜ**, B.B. Goldberg, **A.K. SWAN**, "Screening of Excitons in Single, Suspended Carbon Nanotubes," *Nano Letters*, Vol. 7, No. 6, pp. 1485-1488, 9 May 2007.

A.N. Vamivakas, S.B. Ippolito, **A.K. SWAN**, **M.S. ÜNLÜ**, M. Dogan, E.R. Behringer and B.B. Goldberg, "Phase-sensitive detection of dipole radiation in a fiber-based high numerical aperture optical system," *Optics Letters*, Vol. 32, No. 8, 15, pp. 970-972, April 2007.

Y. Yin, A.G. Walsh, A.N. Vamivakas, S.B. Cronin, A. Stolyarov, M. Tinkham, W. Bacsa, **M.S. ÜNLÜ**, B.B. Goldberg and **A.K. SWAN**, "Tunable Resonant Raman Scattering from Singly Resonant Single Wall Carbon Nanotubes," *IEEE Journal Selected Topics in Quantum Electron.*, Vol. 12, No. 6, pp. 1083, 2006.

Y. Yin, A. N. Vamivakas, A. G. Walsh, S. B. Cronin, **M. S. ÜNLÜ**, B. B. Goldberg, and **A. K. SWAN**, "Optical Determination of Electron-Phonon Coupling in Carbon Nanotubes," *Physical Review Letters*, Vol. 98, No. 3, pp. 037404, 2007.

S. Agarwal, V. Chauhan and **A. TRACHTENBERG**, "Bandwidth Efficient String Reconciliation using Puzzles," *IEEE Transactions on Parallel and Distributed Systems*, Volume 17, Issue 11, pp. 1217 - 1225, November 2006.

Conference Papers

A. Al Daoud, **M. ALANYALI** and **D. STAROBINSKI**, "On pricing of spectrum in secondary markets," *2nd Information Theory and Applications Workshop*, UCSD, January 2007.

A. Al Daoud, **M. ALANYALI** and **D. STAROBINSKI**, "Secondary Pricing of Spectrum in Cellular CDMA Networks," *IEEE DySPAN2007*, Dublin, Ireland, April 2007.

M. ALANYALI, "Some Blocking Bounds for Autonomous Channel Selection in Dynamic Spectrum Access" *44th Allerton Conference on Communications, Control and Computing*, Champaign, IL, September 2006.

M. Dashouk, **M. ALANYALI**, and **M. SHARIF**, "Occupancy distribution of queuing systems with opportunistic scheduling in the downlink," *IEEE International Symposium on Information Theory*, Nice, France, June 2007.

S. Agarwal, M. Laifenfeld, **A. TRACHTENBERG**, **M. ALANYALI**, "Fast data access over asymmetric channels using fair and secure bandwidth sharing," *The 26th IEEE International Conference on Distributed Computing Systems*, Lisbon, Portugal, July 2006.

H. ALTUG, D. Englund and J. Vuckovic "Surface State Photonic Crystal Nanocavity Lasers," *Conference on Lasers and Electro-Optics/International Quantum Electronics 2007*, Baltimore, MD, May 2007.

H. ALTUG, D. Englund and J. Vuckovic, "High Speed Dynamics of Photonic

Crystal Nanocavity Lasers," *IEEE Lasers and Electro-Optics Society Annual Meeting*, Montreal, Canada, November 2006.

F. Bertazzi, M. Goano and **E. BELLOTTI**, "Electron and hole transport in bulk ZnO: A full band Monte Carlo study," *the II-VI Workshop*, Newport Beach, CA, October 2006.

M.S. Amorosino, O.M. A'amar, E. Rodriguez-Diaz, **D.A. CASTAÑÓN**, M.J. O'Brien, Q. Huang, I.J. Bigio and S.K. Singh, "Novel Spectroscopically-Guided Forceps for Polyp Identification," *Annual Meeting of the American College of Gastroenterology*, Bethesda, MD, October 2006.

Y. Li, P. Herczfeld, A. Rosen, **M. BYSTROM** and T. Berceci, "Optical Domain Down-Conversion of Microwave Signals for High Dynamic Range Microwave Fiber Optic Links", *International Topical Meeting on Microwave Photonics*, Grenoble, France, October 2006.

Y. Zhao, **M. BYSTROM**, and I.E.G. Richardson, "A MAP Framework for Efficient Skip/Code Mode Decision in H.264," *IEEE International Conference on Image Processing*, Atlanta, GA, October 2006.

Z. He and **M. BYSTROM**, "A Fast Algorithm for Conversion from DCT Blocks to Integer Cosine Transform Blocks," *IEEE International Conference on Image Processing*, Atlanta, GA, October 2006.

V. SALIGRAMA and **D.A. CASTAÑÓN**, "Reliable distributed estimation with unreliable communications," *Conference on Decision and Control*, San Diego, CA, December 2006.

X. Ma and **D.A. CASTAÑÓN**, "Receding Horizon Planning for Dubins Traveling Salesman Problems," *Conference on Decision and Control*, San Diego, CA, December 2006.

T. VanCourt and **M.C. HERBORDT**, "Application-Specific Memory Interleaving for FPGA-Based Grid Computations: A General Design Technique," *Field Programmable Logic and Applications*, Madrid, Spain, August 2006.

T. VanCourt and **M.C. HERBORDT**, "Sizing of Processing Arrays for FPGA-Based Computation," *Field Programmable Logic and Applications*, Madrid, Spain, August 2006.

Y. Gu and **M.C. HERBORDT**, "FPGA-Based Multigrad for Molecular Dynamics Simulations," *Field Programmable Custom Computing Machines*, April 2007.

Y. Gu, T. VanCourt, **M.C. HERBORDT**, "Improved Interpolation and System Integration for FPGA-Based Molecular Dynamics Simulations," *Field Programmable Logic and Applications*, Madrid, Spain, August 2006.

D.C. Mountain, D. Anderson, G.J. Bresnahan, A. Brughera, S.G. Deligeorges, V. Vajda and **A.E. HUBBARD**, "Simulating Neural Diagnostic and Prosthetic Systems: The EarLab Approach" *BMES Annual Fall Meeting*, Chicago, IL, October 2006.

- S. Lu, D. Mountain, D and **A.E. HUBBARD**, "A Multicompartmental Cochlear Model with a Bi-directional Outer Hair Cell Feedback System," *BMES Annual Fall Meeting*, Chicago, IL, October 2006.
- A. Kumar, H. Qin, **P. ISHWAR**, J. Rabaey, and K. Ramchandran, "Fundamental Bounds on Power Reduction during Data-Retention in Standby SRAM," *2007 IEEE International Symposium on Circuits and Systems (ICAS)*, New Orleans, LA, May 2007.
- A. Kumar, H. Qin, **P. ISHWAR**, J. Rabaey, and K. Ramchandran, "Fundamental Redundancy versus Power Trade-off in Standby SRAM," *2007 IEEE International Conference on Acoustics, Speech, and Signal Processing*, Honolulu Hawaii, April, 2007.
- I. Stojanovic, **M. SHARIF** and **P. ISHWAR**, "On the Diversity-Multiplexing Region of Broadcast Channels with Partial Channel State Information," *44th Annual Allerton Conference on Communication, Control, and Computing*, Monticello, IL, September 2006.
- M. SHARIF** and **P. ISHWAR**, "Benefit of Delay on the Diversity-Multiplexing Tradeoffs of MIMO Channels with Partial CSI," *2007 IEEE International Symposium on Information Theory (ISIT)*, Nice, France, June 2007.
- N. Ma and **P. ISHWAR**, "The Value of Frame-Delays in the Sequential coding of Correlated Sources," *2007 IEEE International Symposium on Information Theory (ISIT)*, Nice, France, June 2007.
- N. Ma, Y. Wang, and **P. ISHWAR**, "Delayed Sequential Coding of Correlated Sources," *2nd International Workshop on Information Theory and its Applications*, San Diego, CA, January 2007.
- P. ISHWAR**, V. Prabhakaran and K. Ramchandran, "On Source Encoding with Side-Information under Ambiguous State of Nature," *2006 IEEE Information Symposium on Information Theory (ISIT)*, pp. 479-483, Seattle, WA, July 2006.
- T.D.C. LITTLE**, **P. ISHWAR** and **J. KONRAD**, "A Wireless Video Sensor Network for Autonomous Coastal Sensing," *Conference on Coastal Environmental Sensing Networks*, Boston MA, April 2007.
- Y. Wang and **P. ISHWAR**, "On Non-Parametric Field Estimation using Randomly Deployed, Noisy Binary Sensors," *2007 IEEE International Symposium on Information Theory (ISIT)*, Nice, France, June 2007.
- Y. Wang, N. Ma, M. Zhao, **P. ISHWAR**, and **V. SALIGRAMA**, "On Universal Distributed Estimation of Noisy Fields with One-bit Sensors," *44th Annual Allerton Conference on Communication, Control, and Computing*, Monticello, IL, September 2006.
- B.J. Davis, **W.C. KARL**, **A.K. SWAN**, **M.S. UNLU** AND B. Goldberg, "Making Use of Rejected Light - Improved Imaging with Multi-Channel Detection in Confocal and 4Pi Microscopy," *Frontiers in Optics 2006 Optical Society of America Annual Meeting*, Rochester, NY, October 2006.
- G. Gaubatz, B. Sunar and **M.G. KARPOVSKY**, "Robust Residue Codes for Fault-Tolerant Public-Key Arithmetic," *International Workshop on Fault Detection and Tolerance in Cryptography*, Yokohama, Japan, October 2006.
- I. Levin, T. Keren, G. Kolotov and **M.G. KARPOVSKY**, "Piece-wise Linearization of Logical Functions," *International Workshop on Spectral Techniques*, 2006.
- K.J. Kulikowski, **M.G. KARPOVSKY** and **A. TAUBIN**, "Power Attacks on Secure Hardware Based on Early Propagation of Data," *12th IEEE International On-Line Testing Symposium*, Lake Como, Italy, July 2006.
- M. Mustafa, **L.B. LEVITIN** and **M.G. KARPOVSKY**, "Weighted Turn Prohibition in Computer Networks," *Opnetwork 2006*, Washington, D.C., August 2006.
- R. Stankovic, J. Astola and **M.G. KARPOVSKY**, "Some remarks on sampling theorem," *International Workshop on Spectral Techniques*, 2006.
- A. Smirnov, A. **TAUBIN** and M.G. **KARPOVSKY**, "On Automatic Synthesis of Data Dependent Micropipelines," *International Workshop on Logic and Synthesis*, Vail, CO, June 2006.
- R. Mathur, C. Lin, K. Aizikov, **R.W. KNEPPER** and P. O'Connor, "Low Noise High Performance Preamplifiers for Non-Destructive Detection of Ions in Precision Mass Spectrometry," *55th ASMS Conference on Mass Spectrometry*, Indianapolis, IN, June 2007.
- A. Jain and **J. KONRAD**, "Crosstalk in automultiscopic 3-D displays: Blessing in disguise?," *SPIE Stereoscopic Displays and Virtual Reality Systems*, San Jose, CA, January 2007.
- S. Ince, **J. KONRAD** and C. Vazquez, "Spline-based intermediate view reconstruction," *SPIE Stereoscopic Displays and Virtual Reality Systems*, vol. 6490, pp. 0F1-0F12, Jan. 2007.
- L. Oddsson, **J. KONRAD**, S. Williams, R. Karlsson and S. Ince, "A rehabilitation tool for functional balance using altered gravity and virtual reality," *5th International Workshop on Virtual Rehabilitation*, New York, NY, August 2006.
- P.M. Jodoin, M. Mignotte, and **J. KONRAD**, "Background subtraction framework based on local spatial distributions," *International Conference on Image Analysis and Recognition*, Póvoa de Varzim, Portugal, September 2006.
- P.M. Jodoin, M. Mignotte and **J. KONRAD**, "Light and fast statistical motion detection method based on ergodic model," *IEEE International Conference on Image Processing*, Atlanta, GA, October 2006.
- R. Lau, S. Ince and **J. KONRAD**, "Compression of still multi-view images for 3-D automultiscopic spatially-multiplexed displays," *SPIE Stereoscopic Displays and Virtual Reality Systems*, pp. 0O1-0O9, San Jose, CA, January 2007.

Publications (cont.)

- P.R. KOTIUGA**, "Synthesis of Force-Free Magnetic Fields as an Unconventional Inverse Problem," *Comsol Users Conference 2006*, Boston, MA, October 2006.
- L.B. LEVITIN** and **T. TOFFOLI**, "Thermodynamic cost of reversible computing," *the IEEE International Symposium on Information Theory, ISIT 2006*, Seattle, WA, July 2006.
- L.B. LEVITIN** and **T. TOFFOLI**, "Energy dissipation in reversible computing," *The 8th International Conference on Quantum Communication, Measurement, and Computing*, MICT and Tamagawa University, Japan, December 2006.
- Y. Rykalova, **L. B. LEVITIN** and R. Brower, "Analysis and simulation of a model of multiprocessor networks," *Advances in Computer Science and Technology, ACST 2007*, Phuket, Thailand, April 2007.
- Y. Rykalova, **L. B. LEVITIN** and R. Brower, "Modeling of Latency and Saturation Phenomena in Interconnection Networks," *the IEEE Symposium on Computers and Communications, ISCC'07*, Aveiro, Portugal, July 2007.
- A. Agarwal and **T.D.C. LITTLE**, "Prospects for Networked Vehicles of the Future," *13th IEEE Real-Time and Embedded Technology and Applications Symposium*, Bellevue, WA, April 2007.
- A. Agarwal, **D. STAROBINSKI**, and **T.D.C. LITTLE**, "Exploiting Downstream Mobility to Achieve Fast Upstream Message Propagation in Vehicular Ad Hoc Networks," *IEEE INFOCOM Mobile Networks for Vehicular Environments Workshop 2007*, Anchorage, AK, May 2007.
- A. Rosales-Garcia, E. Wang, F. Luo, **T.F. MORSE** and J. Hernandez-Cordero, "High Sensitivity Detection Using Intra-Cavity Mode Beating," *18th International Conference on Optical Fiber Sensors*, Cancun, Mexico, October 2006.
- T.F. MORSE** and F. Luo, "A novel pump combiner for high power fiber lasers," *IEEE Lasers and Electro-Optics Society Summer Topical: Lasers, amplifiers, and nonlinear devices*, Quebec City, Canada, July 17, 2006.
- A. Bhattacharyya, R. Chandrasekaran and **T. D. MOUSTAKAS**, "MBE growth of III-Nitride based deep UV-emitters on A-plane sapphire substrates," *North America Molecular Beam Epitaxy Meeting*, Duke University, Durham, NC, October 2006.
- A. Williams and **T.D. MOUSTAKAS**, "Formation of Large-Area Freestanding Gallium Nitride Substrates by Natural Stress-Induced Separation of GaN and Sapphire," *2006 MRS Fall Meeting*, Boston, MA, December 2006.
- A. Bhattacharyya, R. Chandrasekaran and **T.D. MOUSTAKAS**, "MBE Growth of III-Nitride based Deep UV-emitters on A-plane Sapphire Substrates," *2006 MRS Fall Meeting*, Boston, MA, December 2006.
- J. Abell, **T.D. MOUSTAKAS**, L. Zhou and D.J. Smith, "Growth of InGaN /In-GaN MQWs for improved LED efficiency," *2006 MRS Fall Meeting*, Boston, MA, December 2006.
- P. Chen, J. Abell, R. France and **T.D. MOUSTAKAS**, "Growth and Doping of High Quality AlN Films by Cluster Beam Epitaxy," *2006 MRS Fall Meeting*, Boston, MA, December 2006.
- R. Chandrasekaran, A. Bhattacharyya, R. France, C. Thomidis, A. Williams and **T. D. MOUSTAKAS**, "Ultraviolet light emitting diodes using non-polar a-plane AlGaIn MQWs," *III-V Nitride Semiconductor Material and Devices Materials Research Society Symposium Proceeding*, Warrendale, PA, 2007.
- R. Chandrasekaran, A. Bhattacharyya, **T.D. MOUSTAKAS**, L. Zhou, D.J. Smith, A.S. Ozcan, K.F. Ludwig and D. Deniz, "Growth and Doping of Non-polar and Semi-polar GaN and AlGaIn Films and MQWs on the R-plane Sapphire," *2006 MRS Fall Meeting*, Boston, MA, December 2006.
- R. France, T. Xu, P. Chen and **T.D. MOUSTAKAS**, "Vanadium Based Ohmic Contacts to n-AlGaIn in the Entire Alloy Composition," *2006 MRS Fall Meeting*, Boston, MA, December 2006.
- T. D. MOUSTAKAS**, "Significant achievements in III-nitride semiconductor research in the last fifteen years," *European Workshop on III-Nitride Materials and Devices*, Heraklion, Crete, Greece, September 2006.
- T. D. MOUSTAKAS**, "A new model describing the plasma-assisted MBE growth of GaN thin films," *International Workshop on Nitride Semiconductors 2006*, Kyoto, Japan October 2006.
- T. D. MOUSTAKAS**, "Nitride Semiconductor LEDs," *New England chapter of IEEE LEOS, MIT Lincoln Laboratories*, Boston, MA, January 2007.
- Tao Xu, Alexey Nikiforov, Ryan France, Adrian Williams, **THEODORE D MOUSTAKAS**, Lin Zhou and David J Smith, "Blue-Green-Red LEDs based on InGaIn Quantum Dots (QDs) Grown by Plasma-assisted Molecular Beam Epitaxy," *2006 MRS Fall Meeting*, Boston, MA, December 2006.
- THEODORE D. MOUSTAKAS** "Significant achievements in III-Nitride semiconductor research in the last fifteen years," *European Workshop on III-Nitride Semiconductor Material and Devices*, Heraklion, Crete, Greece, September 2006.
- THEODORE D. MOUSTAKAS** and Anirban Bhattacharyya "A new model describing the plasma-assisted MBE growth of GaN thin films," *North America Molecular Beam Epitaxy Meeting*, Duke University, Durham, NC, October 2006.
- Yiyi Wang, Ahmet Ozcan, Karl F Ludwig, Anirban Bhattacharyya and **THEODORE D MOUSTAKAS**, "Real-time Synchrotron X-ray Studies of Ga Droplet and GaN Quantum Dot Formation by Droplet Heteroepitaxy on C-plane Sapphire," *2006 MRS Fall Meeting*, Boston, MA, December 2006.
- S.H. NAWAB**, R. Wotiz, C J De Luca, "Multi-Receiver Precision Decomposi-

- tion of Intramuscular EMG Signals," *International Conference of the IEEE Engineering in Medicine and Biology Society*, New York, NY, September 2006.
- K. Driscoll and **R. PAIELLA**, "Silicon-Based Quantum Cascade Lasers Using Electronic Intersubband Transitions in the L Valleys," *IEEE Lasers and Electro-Optics Society Annual Meeting*, Montreal, Canada, November 2006.
- B. C. Lai, P. Schaumont, **W. QIN** AND I. Verbauwheide, "Cross Layer Design to Multi-thread a Data-Pipelining Application on a Multi-processor on Chip," *IEEE 17th International Conference on Application-specific Systems, Architectures and Processors*, Steamboat Springs, CO, September, 2006.
- W. QIN**, J. D'Errico and X. Zhu, "A Multiprocessing Approach to Accelerate Retargetable and Portable Dynamic-compiled Instruction-set Simulation," *International Conference on Hardware/Software Codesign and System Synthesis*, Seoul, Korea, October 2006.
- W. QIN**, J. D'Errico and X. Zhu, "A New Approach to Constructing Portable Instruction-Set Simulators," *Fifth Annual Boston Area Architecture Workshop*, Boston, MA, January 2007.
- W. QIN**, "RFSM: A Rendezvous of TLM and RTL," *IEEE 7th International Workshop on Microprocessor Testing and Verification*, Austin, TX, December 2006.
- X. Zhu and **W. QIN**, "Modeling a Fault-Tolerant Multiprocessor SoC with Run-time Fault Recovery," *43rd ACM Design Automation Conference*, San Francisco, CA, July 2006.
- Y. Mahajan, C. Chan, A. Bayazit, S. Malik and **W. QIN**, "Verification Driven Formal Architecture and Microarchitecture Modeling," *5th ACM-IEEE International Conference on Formal Methods and Models for Codesign*, Nice, France, May, 2007.
- M. RUANE**, "Vertically Integrated Research Experiences", *9th International Conference on Engineering Education*, San Juan, Puerto Rico, July 2006.
- A. F. Abouraddy, T. Yarnall, **B. E. A. SALEH**, and **M. C. TEICH**, "Violation of Bell's Inequality in Spatial Parity Space," *Annual Conference on Lasers and Electro Optics/Quantum Electronics and Laser Science*, Baltimore, MD, May 2007.
- A. F. Abouraddy, T. Yarnall, **B. E. A. SALEH**, and **M. C. TEICH**, "Violation of Bell Inequality in Spatial Parity Space," *International Conference on Quantum Information*, Rochester, NY, June 2007.
- A. V. SERGIENKO**, M. Jaspan, **B. E. A. SALEH**, and **M. C. TEICH**, "Quantum Cryptography with Optical Entanglement at 1.5 μm ," *Frontiers in Optics 2006 Optical Society of America Annual Meeting*, Rochester, NY, October 2006.
- A. V. SERGIENKO**, M. Jaspan, **B. E. A. SALEH**, and **M. C. TEICH**, "Engineering Optical Entanglement for Quantum Telecommunication," *SPIE Annual Meeting: Optics & Photonics*, San Diego, CA, August 2006.
- A. V. SERGIENKO**, M. Jaspan, **B. E. A. SALEH** and **M. C. TEICH**, "Optical Entanglement for Quantum Telecommunication," *SPIE Photonics East*, Boston, MA, October 2006.
- B. E. A. SALEH**, **M. C. TEICH**, S. Carrasco, and J. T. Fourkas, "Harmonic Generation with Vector Gaussian Beams," *Annual Meeting of the Optical Society of America*, Rochester, NY, October 2006.
- C. Bonato, **A. V. SERGIENKO**, **B. E. A. SALEH** and **M. C. TEICH** "Two-Photon Spectral Coherency Matrix and Multi-Parameter Optical Entanglement," *Conference on Lasers and Electro-Optics/International Quantum Electronics Conference 2007*, Baltimore, MD, May 2007.
- M. B. Nasr, **A. V. SERGIENKO**, **B. E. A. SALEH**, **M. C. TEICH**, D. Hum, and M. M. Fejer, "Generation of Ultra-Broadband Spontaneous Parametric Down Conversion (SPDC) from Chirped Periodically Poled Stoichiometric Lithium Tantalate (C-PPSLT)," *International Conference on Quantum Information*, Rochester, NY, June 2007.
- T. Yarnall, A. F. Abouraddy, **B. E. A. SALEH**, and **M. C. TEICH**, "Generation and Analysis of Entangled Two-Photon States in Spatial-Parity Space," *International Conference on Quantum Information*, Rochester, NY, June 2007.
- E. Ermis and **V. SALIGRAMA**, "Robust Detection Strategies for Non-Ideal Sensing Models," *2nd IEEE International Conference on Acoustics, Speech, and Signal Processing*, Honolulu, HI, April 2007.
- G. Atia, **M. SHARIF**, and **V. SALIGRAMA**, "Effect of geometry on the diversity multiplexing tradeoff in relay channels," *IEEE Globecom*, San Francisco, CA, November 2006.
- G. Atia, **M. SHARIF**, and **V. SALIGRAMA**, "On optimal outage in relay channels with general fading distributions," *44th Annual Allerton Conference on Communication, Control, and Computing*, Monticello, IL, October 2006.
- S. Aeron, M. Zhao and **V. SALIGRAMA**, "Fundamental Tradeoffs: Limited Sensing, Sensing Diversity and Sensing Capacity," *40th Asilomar Conference on Signals, Systems and Computers*, Pacific Grove, CA, October 2006.
- S. Aeron, M. Zhao and **V. SALIGRAMA**, "Sensing Capacity, Diversity and Sparsity: Fundamental Tradeoffs," *ITA UCSD Workshop*, San Diego, CA, February 2007.
- S. Aeron, **V. SALIGRAMA** and **D.A. CASTAÑÓN**, "Energy efficient policies for distributed target tracking in multihop sensor networks," *Conference on Decision and Control*, San Diego, CA, December 2006.
- M. Diaz, **J. SEMETER** and M. Oppenheim, "Particle-in-cell simulation of the incoherent scatter spectrum," *URSI National Radio Science Meeting*, Ottawa, Canada, June 2007.
- Kosch, M.J., B. Gustavsson, E.M. Blixt, T. Pedersen, A. Senior, A.J. Kavanagh and **J. SEMETER**, "EISCAT radar and optical studies of black aurora: A sig-

Publications (cont.)

nature of magnetospheric turbulence?" *8th International Conference on Substorms*, Banff, Canada, March 2006.

J. SEMETER and E.M. Blixt, "Optical evidence for Alfvén wave breaking in the near-Earth magnetosphere," *AGU Fall Meeting*, San Francisco, CA, December 2006.

J. SEMETER, "Phase- and group-motion in the aurora and its relationship to laboratory plasma wave dispersion," *AGU Spring Meeting*, Acapulco, Mexico, May 2007.

J. SEMETER, "The footprint of the magnetosphere's most interesting boundary," *Greenland Space Science Symposium*, Kangerlussuaq, Greenland, May 2007.

I. Stojanovic, **M. SHARIF** and **D. STAROBINSKI**, "Data Dissemination in Wireless Broadcast Channels: Network Coding or Cooperation?" *47th Annual Conference on Information Sciences and Systems*, Baltimore, MD, March 2007.

N. Devroye and **M. SHARIF**, "The multiplexing gain of MIMO X channels with partial transmit side information," *IEEE International Symposium on Information Theory*, Nice, France, June 2007.

A. Singh and **D. STAROBINSKI**, "A Semi Markov-based Analysis of Rate Adaptation Algorithms in Wireless LANs," *IEEE SECON 2007*, San Diego, CA, June 2007.

D. STAROBINSKI, W. Xiao, **X. QIN**, and **A. TRACHTENBERG**, "Near-Optimal Data Dissemination in Multi-Channel, Single Radio Wireless Sensor Networks," *IEEE INFOCOM Mobile Networks for Vehicular Environments Workshop 2007*, Anchorage, AK, May 2007.

N. Fazlollahi, R. Cohen and **D. STAROBINSKI**, "On the Capacity Limits of Advanced Channel Reservation Architectures," *IEEE INFOCOM Mobile Networks for Vehicular Environments Workshop 2007*, Anchorage, AK, May 2007.

R. Cohen, N. Fazlollahi and **D. STAROBINSKI**, "Graded Channel Reservation with Path Switching in Ultra High Capacity Networks," *Third International Workshop on Networks for Grid Applications*, San Jose, CA, October 2006.

T. Wu and **D. STAROBINSKI**, "On the Price of Anarchy in Unbounded Delay Networks," *First Workshop on Game Theory for Networks*, Pisa, Italy, October 2006.

M. Knight, R. Reisberg, K. Ziemer, P. Wong and **A. SWAN**, "A Model STEM Team? Building Outreach Opportunities Across Cultures," *Women in Engineering Programs and Advocates Network Annual Conference*, Albuquerque, NM, June 2006.

A.N. Vamivakas, **M.S. UNLU**, **A.K. SWAN**, Y. Yin, A. Walsh and B.B. Goldberg "One and two phonon resonance Raman scattering from single wall

carbon nanotubes" *Near Field Optics 09*, Zurich, Switzerland, September 2006.

A. Walsh A. N. Vamivakas, Y. Yin S. Cronin, **M.S. UNLU**, B.B. Goldberg and **A.K. SWAN**, "Controlled Screening of Excitons in Single, Suspended Carbon Nanotubes," *American Physical Society Meeting*, Denver, CO, March 2007.

A. Walsh, A.N. Vamivakas, Y. Yin, S. Cronin, **M. S. UNLU**, B.B. Goldberg and **A.K. SWAN**, "Screening of Excitons in Single, Suspended Carbon Nanotubes in Varying Environment," *Wonton, Canada*, June 2007.

A. Walsh, A.N. Vamivakas, Y. Yin, S. Cronin, **M.S. UNLU**, B.B. Goldberg and **A.K. SWAN**, "Screening Of Excitons In Single, Suspended Carbon Nanotubes," *Frontiers in Optics 2006 Optical Society of America Annual Meeting*, Rochester, NY, October 2006.

A. Walsh, B. Schlatka, M. Meinhold, T. Rueckes, M. Linehan, A. N. Vamivakas, Y. Yin **M.S. UNLU**, B.B. Goldberg, **A.K. SWAN**, "Modified Blackbody Emission from Carbon Nanotube Devices," *MRS Fall Meeting*, Boston, MA, December 2006.

E.R. Behringer, A.G. Krause, A.N. Vamivakas, B.B. Goldberg, **M.S. ÜNLÜ** and **A.K. SWAN**, "An Advanced Exploration in Optics: The Solid Immersion Microscope," *American Association of Physics Teachers*, Rochester, NY, July 2006.

M. Dogan, P. Dröge, **A.K. SWAN**, **M.S. ÜNLÜ**, and B.B. Goldberg, "Probing DNA-IHF Interactions on Surfaces Using Optical Interference Techniques," *American Physical Society Meeting*, Denver, CO, March 2007.

M. Dogan, B.B. Goldberg, **A.K. SWAN** and **M.S. ÜNLÜ**, "Spectral Self-interference 4Pi Microscopy," *MRS Fall Meeting*, Boston, MA, December 2006.

Y. Yin, A. Vamivakas, A. Walsh, S. Cronin, **M.S. ÜNLÜ**, **B.B. GOLDBERG** and **A.K. SWAN**, "Resonant Raman scattering excitation profiles from a 1D system," *MRS Fall Meeting*, Boston, MA, December 2006.

A. Smirnov and **A. TAUBIN**, "Synthesizing Asynchronous Micropipelines with Design Compiler," *SVUG*, Boston, MA, September 2006.

T. Singh and **A. TAUBIN**, "A GALS Solution Based on Highly Scalable, Low Latency, Crossbar Using Token Ring Arbitration," *The 49th IEEE International Midwest Symposium on Circuits and Systems*, August 2006.

M. Laifenfeld, **A. TRACHTENBERG** and T.Y. Berger-Wolf, "Identifying codes and the set cover problem," *44th Annual Allerton Conference on Communication, Control, and Computation*, Monticello, IL, October 2006.

S. Agarwal, A. Hagedorn and **A. TRACHTENBERG**, "Near optimal update-broadcast of data sets," *International Workshop on Data Intensive Sensor Networks 2007*, Mannheim, Germany, May 2007.

M. S. ÜNLÜ, "Spectral Self-interference Microscopy," *Molecular Biomimet-*

ics and Bionanotechnology II, Istanbul Technical University, Istanbul, May 2007.

M.S. ÜNLÜ, B.B. Goldberg, A.N. Vamivakas and F.H. Koklu "High-Resolution Subsurface Microscopy: Numerical Aperture Increasing Lens," *E-MRS 2007 Spring Meeting*, Strasbourg, France, May 2007.

P. Muller, M. K. Emsley, A. Tajalli, M. Ataraodi, **M. S. ÜNLÜ** and Y. Leblebici, "Design and Integration of All-Silicon Fiber-Optic Receivers for Multi-Gigabit Chip-to-Chip Links," *European Solid-State Circuits Conference*, Montreux, Switzerland, September 2006.

Invited Lectures

M. ALANYALI, A. Daoud and **D. STAROBINSKI**, "Pricing spectrum access in cellular CDMA networks with heterogeneous demand," *IEEE Broadnets 2007*, Raleigh, September 2007.

M. ALANYALI, "Dynamics of Reinforcement Learning with Applications in Data Networks," McGill University, March 2007.

A. Al Daoud, **M. ALANYALI** and **D. STAROBINSKI**, "On pricing of spectrum in secondary markets," 2nd Information Theory and Applications Workshop, UCSD, January 2007.

S. Agarwal, M. Laifenfeld, **A. TRACHTENBERG** and **M. ALANYALI**, "Using bandwidth sharing to fairly overcome channel asymmetry," *Information Theory and its Applications Inaugural Workshop*, La Jolla, CA, 2006.

H. ALTUG, "Nanophotonic devices and their on-chip integration with Silicon, Indium Phosphide and Gallium Arsenide," Hatice Altug Invited Talk, Northern California Advance Science and Technology (NCCAUS), Sunnyvale, CA, October 2006.

H. ALTUG, "Nanophotonic Devices for Communications and Sensing," BU Nanophotonics Symposium, Boston, MA, May 2007.

H. ALTUG, "Nanophotonic Devices for Communications and Sensing," LEOS New England Chapter Spring Symposium, Boston, MA, June 2007.

E. BELLOTTI, "Design and Simulation of Optoelectronics Devices From the UV to the Far IR," MIT Lincoln Laboratory, MA, February 2006.

I.J. BIGIO, "Future clinical applications of diagnostic optical spectroscopy and functional diffuse imaging," CIMIT Forum, Mass. General Hospital, MA, May 2007.

I.J. BIGIO, "Spectroscopic diagnosis of bladder cancer with elastic light scattering," *Imaging Science Development for Cancer Prevention and Prevention Workshop*, National Cancer Institute, Bethesda, MD, July 2006.

I.J. BIGIO, "Elastic scattering spectroscopy for noninvasive detection of cancer," *International Symposium on Modeling and Control in Biomedical Systems*, Reims, France, September 2006.

I.J. BIGIO, "Elastic light scattering spectroscopy for the detection of early cancer and pre-cancer," *OASIS Conference*, Tel Aviv, Israel, March 2007.

I.J. BIGIO, "Optical Biopsy: noninvasive detection of early cancer with elastic-scattering spectroscopy," *Physics Colloquium: University of Massachusetts*, Lowell, MA, October 2006.

M. BYSTROM, "Image Texture Representation via the Contourlet and an Application to Image Retrieval," *Boston Chapter IEEE Signal Processing Society*, Boston, MA, May 2007.

L. DAL NEGRO, "LEOS06: Nanophotonics," *LEOS Conference*, Montreal, Canada, October 29 – November 2, 2006.

L. DAL NEGRO, "Silicon-based Light Emitting Nanomaterials and Photonic



Professor Roscoe Giles

Structures," *LEOS New Hampshire Chapter*, Verizon Labs, Weltham, November 2006.

M.C. HERBORDT, T. VanCourt, Y. Gu, B. Sukhwani, J. Model, A. Conti and D. DiSabello, "Case Studies in FPGA Acceleration of Computational Biology and their Implications to Development Tools," *2nd Reconfigurable Systems Summer Institute*, Champaign, IL, July 2006.

M. HERBORDT, "FPGA-Based High Performance Computing: Opportunities and Challenges," *Konrad-Zuse Zentrum für Informationstechnik*, Berlin, Germany, July 2006.

Publications (cont.)

A.E. HUBBARD, "The benefit of delays in sequential coding of correlated sources," Harvard University, Cambridge, MA, February 2007.

A.E. HUBBARD, D. Freedman, C. Dorta-Quiñones, B. Do Valle and F.I. Shavaklou, "A Fully-Differential Current-Mode Analog Cochlea," 10th Annual Boston University Photonics Center Symposium, Boston, MA June 2007.

D. Freedman, C. Dorta-Quiñones, B. Do Valle, F.I. Shavaklou and **A.E. HUBBARD**, "A Fully-Differential Current-Mode Analog Cochlea," Boston University Science and Engineering Research Symposium, Boston, MA, April 2007.

C.A. Browning and **A.E. HUBBARD**, "Development of a Graphical User Interface for an Acoustic Direction Finder System," Boston University Presentation Symposium, Boston, MA, 2006.

Y. Pu, M. Chiu, D. Freedman, M.Nourzad, S.Deligeorges and **A.E. HUBBARD**, "DSP Implementation of a Biomimetic Acoustic Localizing System," 10th Annual Boston University Photonics Center Symposium, June 2007.

Y. Pu, M. Chiu, D. Freedman, M.Nourzad, S.Deligeorges and **A.E. HUBBARD**, "DSP Implementation of a Biomimetic Acoustic Localizing System," Boston University ECE Department Open House, March 2007.

Y. Pu, M. Chiu, D. Freedman, M.Nourzad, S.Deligeorges and **A.E. HUBBARD**, "DSP Implementation of a Biomimetic Acoustic Localizing System," Boston University Science and Engineering Research Symposium, April 2007.

A. E. HUBBARD, S. Lu, J. Spisak and D.C. Mountain, "A multi-compartment cochlear model with piezo-electric outer hair cells: Methods and results, #7015," 5th World Congress of Biomechanics, Munich, Germany, July 2006.

D. Mountain, D. Anderson, G. Bresnahan, S. Deligeorges, **A.E. HUBBARD**, V. Vajda and V. Earlab, "A modular approach to auditory simulation #6781," 5th World Congress of Biomechanics, Munich, Germany, July 2006.

S. Deligeorges, A. Zosuls, D. Anderson, T. Gore, C. Karl, D.C. Mountain and **A.E. HUBBARD**, "A Biomimetic System for Localizing Sound," NATO Symposium on Battlefield Acoustic Sensing for ISR Applications, Amsterdam, the Netherlands, October 2006.

M. Nourzad, C. Karl, S. Deligeorges and **A.E. HUBBARD**, "Time Shared Architecture: A new approach to parallel spike computation in a real-time biomimetic acoustic localizing system," 10th Annual Boston University Photonics Center Symposium, Boston, MA, June 2007.

M. Nourzad, C. Karl, S. Deligeorges and **A.E. HUBBARD**, "Time Shared Architecture: A new approach to parallel spike computation in a real-time biomimetic acoustic localizing system," Boston University ECE Department Open House, Boston, MA, March 2007.

M. Nourzad, C. Karl, S. Deligeorges and **A.E. HUBBARD**, "Time Shared Architecture: A new approach to parallel spike computation in a real-time

biomimetic acoustic localizing system," Boston University Science and Engineering Research Symposium, Boston, MA, April 2, 2007.

M. Nourzad, C. Karl, S. Deligeorges and **A.E. HUBBARD**, "Time Shared Architecture: A new approach to parallel spike computation in a real-time biomimetic acoustic localizing system," 11th International Conference on Cognitive and Neural Systems, Boston University, Boston, MA, May 2007.

R. Mathur, **R. KNEPPER** and P.B. O'Connor, "Cryogenic Detection Circuit for a Fourier Transform Mass Spectrometer," IMAPS Conference, April 2007.

J. KONRAD, "3-D display technologies: Then and Now," Analogic Corporation, Peabody, MA, March 2007.

J. KONRAD, "3-D TV without glasses: optics meets signal processing," International 3-D Forum Dimension 3 Expo, Chalon-sur-Saone, France, June 2007.

P.R. KOTIUGA, "Computational Complexity of Homology Calculations and the Realization of Representing Cycles as Embedded Manifolds," Gilles Fournier Memorial Conference on Classical and Computational Topological Methods, Bishop's University, Sherbrooke, Canada, September 2006.

P.R. KOTIUGA, S. Tordeux and R. Hiptmair, "Synthesis of Force-Free Magnetic Fields via Curl Operator Eigenvalue Problems with Non-Classical Boundary Conditions," SIAM Annual Meeting, Boston, MA, July 2006.

P.R. KOTIUGA, "Self-Adjoint Curl Operators and Applications to the Synthesis of Force-free Magnetic Fields. Oberwolfach Conference on Computational Electromagnetics and Acoustics," Mathematisches Forschungsinstitut, Oberwolfach, Germany, February 2007.

P.R. KOTIUGA, "Synthesis of Force-Free Magnetic Fields as an Unconventional Inverse Problem," Comsol Users Conference 2006, Boston, MA, October 2006.

T. MORSE, IEEE LEOS Summer Topical Meeting: Lasers, amplifiers, and nonlinear devices, July 2006.

T. D. MOUSTAKAS, "Significant achievements in III-nitride semiconductors research in the last fifteen years" European Workshop on III-Nitride Materials and Devices, Heraklion, Crete, Greece, September 2006.

T. D. MOUSTAKAS, "A new model describing the plasma-assisted MBE growth of GaN thin films" International Workshop on Nitride Semiconductors 2006, Kyoto, Japan, October 2006.

T. D. MOUSTAKAS, "GaN R&D at Boston University with emphasis in Solid State Lighting" The 10th Annual Boston University Photonics Center Symposium, Boston, MA, June 2007.

T. D. MOUSTAKAS, "Nitride Semiconductor LEDs" New England chapter of IEEE LEOS, MIT Lincoln Laboratories, MA, January 2007.

- W. QIN**, "A Survey of Architecture Description Languages," Intel Corporation, Haifa, IL, November 2006.
- W. QIN**, "MADL: An Architecture Description Languages for Software Tool-chain Synthesis," Intel Corporation, Haifa, IL, November 2006.
- W. QIN**, "RFSM: A Formalism for Modeling Complex Digital Systems," Freescale Semiconductors, Austin, TX, September 2006.
- V. SALIGRAMA**, "Sensing Capacity, Diversity & Sparsity: Fundamental Tradeoffs," Institute for Pure and Applied Mathematics (IPAM) Mathematical Challenges and Opportunities in Sensor Networking Workshop, University of California, Los Angeles, CA January 2007.
- V. SALIGRAMA**, "Sensing Capacity, Diversity & Sparsity: Fundamental Tradeoffs," Information Theory and Applications Workshop, University of California, San Diego February 2007.
- J. SEMETER**, "Particle Acceleration in Space Plasmas: A Remote Sensing Perspective," University of Illinois Graduate Electrical Engineering Seminar Series, Urbana, IL, October 2006.
- A. SERGIENKO**, "Precise Quantum-Optical Measurement with Engineered Entangled-Photon States," Seminar Center for Microwave Magnetic Materials and Integrated Circuits, Northeastern University, Department of Electrical and Computer Engineering, November 2006.
- A. SERGIENKO**, "Engineered Photon Entanglement and New Quantum-Optical Measurement Techniques", FOCUS Seminar, University of Michigan Ann Arbor, November 2006.
- A. SERGIENKO**, "Engineering Quantum Entanglement for Precise Optical Measurement", Institute for Fundamental Electronics, Orsay, France, September 2006.
- M. SHARIF**, "Peak to Average Power Reduction for Multicarrier Signals," Rambus, Incorporated, Los Altos, CA, March 2007.
- D. STAROBINSKI**, "Multi-channel Data Dissemination in Large Wireless Sensor Networks: Single Radios Suffice," Boston University Sensor Network Consortium, Boston, MA, June 2007.
- D. STAROBINSKI**, "On the Capacity Limits of Advanced Channel Reservation Architectures," IEEE INFOCOM High-Speed Networking Workshop 2007, Anchorage, AK, May 2007.
- A. SWAN**, "Photo-Physics of Carbon Nanotubes," Boston University Physics Colloquium, Boston, MA, May 2007.
- A. SWAN**, "Resonant Raman Profiles- Exciton Screening and E-phonon Coupling," European Material Research Society, Strasbourg, France, May 2007.
- A. SWAN**, "Optical determination of electron phonon coupling in carbon nanotubes," Los Alamos & Center for Non-Linear Studies Workshop on Electronic and Vibrational Interactions in Carbon Nanotubes, Santa Fe, NM, September 2006.
- A. SWAN**, "Measurements of Electron-Phonon Coupling Strengths in Carbon Nanotubes," Frontiers in Optics 2006 Optical Society of America Annual Meeting, Rochester NY, October 2006.
- A. SWAN**, "Novel Materials for Micro- and Nanoelectronics" Pan American Advanced Study Institute Work Shop, Renaca, Chile Jan 2007.
- A. SWAN**, "Photo-physics of carbon nanotubes," Center for Material Elaboration & Structural Studies, Toulouse, France, May 2007.
- M. C. TEICH**, "Multi-Photon and Entangled-Photon Imaging and Lithography," Department of Electrical & Computer Engineering Colloquium, University of New Mexico, and IEEE LEOS Albuquerque Chapter Lecture, Albuquerque, NM, May 2007.
- M. C. TEICH**, "Multi-Photon and Entangled-Photon Imaging and Lithography," General Physics Seminar, Louisiana State University, Baton Rouge, LA, February 2007.
- M. C. TEICH**, "Quantum Optical Coherence Tomography," Photonics Center Faculty Forum, Boston University, Boston, MA, April 2007.
- S. Agarwal and **A. TRACHTENBERG**, "Approximating the number of differences between remote sets," IEEE Information Theory Workshop, Punta del Este, Uruguay, 2006.
- A. TRACHTENBERG**, "Mathematical approaches to efficient data Reconciliation," Technion Israel Institute of Technology, Technion City, Israel, November, 2006.
- S. ÜNLÜ**, "Applications of Optical Resonance to Biological Sensing and Imaging," and "Numerical Aperture Increasing Lens Microscopy for Quantum Dot and Integrated Circuit Imaging," Anadolu University, Eskisehir, Turkey, April 2007.
- S. ÜNLÜ**, "Applications of Optical Resonance to Biological Sensing and Imaging," Anadolu University, Eskisehir, Turkey, ETH Zürich, Biomaterials Group, December 2006.
- S. ÜNLÜ**, "Applications of Optical Resonance to Biological Sensing and Imaging," ETH Zürich, Nano-optics Group, Zürich, Germany, December 2006.
- S. ÜNLÜ**, "Applications of Optical Resonance to Biological Sensing and Imaging," IEEE/LEOS Distinguished Lecture, Göttingen, Germany, December 2006.
- S. ÜNLÜ**, "Nanoscale Imaging of Semiconductor and Biological Systems," IEEE/LEOS Distinguished Lecture, Japan Chapter, Tokyo, Japan, September 2006.

Publications (cont.)

S. ÜNLÜ, "Numerical Aperture Increasing Lens Microscopy for Quantum Dot and Integrated Circuit Imaging," IEEE/LEOS Distinguished Lecture, NTU, Singapore, January 2007.

S. ÜNLÜ, "Applications of Optical Resonance to Biological Sensing and Imaging," IEEE/LEOS Distinguished Lecture, NUS/IMRE, Singapore, January 2007.

S. ÜNLÜ, "Nanoscale Imaging of Semiconductor and Biological Systems," IEEE/LEOS Distinguished Lecture, Tübingen, Germany, November 2006.

S. ÜNLÜ, "Nanometre Boyutunda Görüntüleme: Yarıiletken ve Biyolojik Alanında Uygulamalar," IEEE/LEOS Distinguished Lecture, Turkish Chapter, National Photonics Workshop, Istanbul, September 2006.

S. ÜNLÜ, "Numerical Aperture Increasing Lens Microscopy for Quantum Dot and Integrated Circuit Imaging," Istanbul Technical University, Istanbul, Turkey, March 2007.

S. ÜNLÜ, "Applications of Optical Resonance to Biological Sensing and Imaging," Koc University, Istanbul, Turkey, April 2007.

S. ÜNLÜ, "Applications of Optical Resonance to Biological Sensing and Imaging," Sabanci University, Istanbul, Turkey, June 2007.

S. ÜNLÜ, "Numerical Aperture Increasing Lens Microscopy for Quantum Dot and Integrated Circuit Imaging," Sabanci University, Istanbul, Turkey, April 2007.

Patents and Patent Disclosures:

H. ALTUG and J. Vuckovic, "Coupled nanoscale photonic cavity devices," Patent Disclosure, 2007

I.J. BIGIO, "Pattern recognition algorithms for spectral classification with applications to detection/screening of cancer and other pathologies using optical spectroscopy," Patent disclosure.

I.J. BIGIO, "Method of extracting the optical properties of small volumes of superficial turbid media," Patent Disclosure.

I.J. BIGIO, "Biopsy forceps incorporating an optical spectroscopy fiber probe," Patent disclosure.

I.J. BIGIO, "Biopsy snare incorporating an optical spectroscopy fiber probe," Patent disclosure.

A.E. HUBBARD, "Biomimetic Acoustic Detection and Localization System," Patent disclosure.

K. Kulikowski, **M.G. KARPOVSKY** and **A. TAUBIN** US11/476,421 "System Employing Systematic Robust Error Detection Coding to Protect System

Element Against Errors with Unknown Probability Distributions," United States Patent Application 20070019805, published January 2007.

T. MORSE, "High Definition X-Ray Scintillation Detector," Patent Disclosure.

R. PAIELLA, T.D. MOUSTAKAS, K. Driscoll and A. Bhattacharyya, "Terahertz Light Sources Based on Intersubband Transitions in Wide-Bandgap Semiconductors," Patent Disclosure, April 2007.

T.D. MOUSTAKAS and A. Williams, "Planarization of GaN by Photoresist Technique using an inductively Coupled Plasma," International Application (PCT) no. PCT/US2007/002943, filed February 2, 2007.

T.D. MOUSTAKAS and A. Williams, "Planarization of GaN by Photoresist Technique using an inductively Coupled Plasma," US Patent Application no. 60/880, 758, filed January 17, 2007.

T.D. MOUSTAKAS and J. Cabalu, "Optical Devices Featuring Textured Semiconductor Layers," European Patent Application no. 05 744 389.7, published December 2006, Publication no. 1735838.

T.D. MOUSTAKAS and J. Cabalu, "Optical Devices Featuring Textured Semiconductor Layers" International Application (PCT) no. PCT/US2006/042483, filed October 31, 2006, Publication no. WO 2007/053624 A2.

T.D. MOUSTAKAS and J. Cabalu, "Optical Devices Featuring Textured Semiconductor Layers" U. S. Patent Application No 11/590,687, filed October 31, 2006, Publication no. US-2007-0120141-A1.

T.D. MOUSTAKAS, "Highly Insulating monocrystalline Gallium Nitride Thin Films", Japanese Patent no. 3817206, June 16, 2006.

T.D. MOUSTAKAS, "Highly Insulating monocrystalline Gallium Nitride Thin Films", Japanese Patent no. 3817206, June 16, 2006.

T.D. MOUSTAKAS, "Semiconductor Device Having Highly Insulating monocrystalline Gallium Nitride Thin Films," Japanese Patent Application 2007-24009, filed February 2, 2007.

T.D. MOUSTAKAS, "Semiconductor Device having Group-III Nitride Buffer Layer and Growth Layers," U.S. Patent no. 7,235,819, June 26, 2007.

M.S. ÜNLÜ, B.B. Goldberg, **A.K. SWAN**, S.B. Ippolito, L. Moiseev, S. Lipoff and Y. Tong, "Spectroscopy of Fluorescence for Vertical Sectioning," granted in 2006.

5.4 Grants, Contracts, & Gifts

The following tables delineate the new grants awarded over the 2007 fiscal year. The funding level for new grants, where an ECE faculty member is the Principal Investigator (PI) is approximately \$4.6M. ECE faculty mem-

bers 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 \$2.7M. The total of new grants is therefore approximately \$7.3M.

New Grants with ECE Principal Investigators

RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END	AMOUNT
Bellotti, Enrico	Deep UV Semiconductor Laser for in situ Organic and Biological Exploration (see source #9206-5) (Subcontract via Photon Systems, Inc.)	NASA	1/1/2006	12/31/2007	\$25,000
Bellotti, Enrico	SBIR: Development of Low Stress Ohmic Contacts to HgCdTe (Subcontract via Photronix, Inc.)	DOD/Army	9/22/2006	12/14/2008	\$120,000
Castanon, David	Center for Subsurface Sensing and Imaging Systems (CenSSIS) -- Research Thrust 2 (Subcontract via Northeastern Univ.)	NSF	9/1/2006	8/31/2007	\$291,772
Castanon, David Karl, W. Clement	MURI: Fusion and Sensor Management for Automatic Target Exploitation (in conjunction with Center for Information and Systems Engineering) (Subcontract via Ohio State University)	DOD/Air Force	5/1/2006	9/30/2006	\$95,361
Castanon, David Karl, W. Clement	MURI: Fusion and Sensor Management for Automatic Target Exploitation (in conjunction with Center for Information and Systems Engineering) (Subcontract via Ohio State University Research Foundation)	DOD/Air Force	5/1/2006	9/30/2007	\$249,994
Castanon, David Konrad, Janusz	Image-Based Tracking Algorithms for Unmanned Air Vehicles (Phase I STTR) (in conjunction with Center for Information and Systems Engineering) (Subcontract via Parietal Systems, Inc.)	DOD/Air Force	11/1/2006	5/31/2007	\$34,734
Castanon, David Cassandras, Christos	Distributed Mission Control for Unmanned Air Vehicles in Stochastic Environments (\$110,165)	DOD/Air Force	7/1/2007	11/30/2007	\$55,083
Dal Negro, Luca	MURI: Electrically-Pumped, Silicon-Based Lasers for Chip-Scale Nanophotonic Systems (Subcontract via MIT)	DOD/Air Force	7/1/2006	11/30/2006	\$41,667
Dal Negro, Luca	MURI: Electrically-Pumped, Silicon-Based Lasers for Chip-Scale Nanophotonic Systems (Subcontract via MIT)	DOD/Air Force	7/1/2006	11/30/2007	\$100,000
Herbordt, Martin	Accelerated Fault-Tolerant Computing in Space with Reconfigurable Circuits	DOD/Navy	11/1/2005	10/31/2006	\$25,000
Horenstein, Mark	STTR: Low Power MEMS Retroreflectors for Optical Communication (Subcontract via Boston Micromachines Corporation)	DOD/Army	8/4/2006	2/4/2007	\$33,755
Hubbard, Allyn	Photonics Technology Development and Insertion/ Task 25: Acoustic Sniper Detection (in conjunction with Photonics Center)	DOD/Army	7/1/2006	6/30/2007	\$150,000
Karl, W. Clement	Foundation for Automatic Target Recognition (in conjunction with Center for Information and Systems Engineering)	DOD/Air Force	2/1/2007	11/30/2007	\$82,443
Lee, Min-Chang	Controlled Studies of Whistler Wave Interactions with Energetic Particles in Radiation Belts	DOD/Air Force	12/1/2006	11/30/2007	\$110,000
Little, Thomas	Graduate Student Support (J. Tower) (in conjunction with Center for Information and Systems Engineering) (Subcontract via MIT/Lincoln Laboratory)	MIT Lincoln Lab	9/1/2006	12/31/2006	\$13,962

New Grants with ECE Principal Investigators (cont.)

RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END	AMOUNT
Little, Thomas	Body-Area Instrumentation for Avoidance of Workplace Injury	The Hartford Fire Insurance Company	5/25/2007	12/31/2007	\$66,000
Morse, Theodore	Specialty Fibers for Clinical Applications	DOD/Air Force	2/1/2007	1/31/2008	\$150,000
Morse, Theodore	Doped Silica Preforms and Tubes: OVD Process	OFS Laboratories, LLC	5/21/2007	5/20/2008	\$30,000
Morse, Theodore	Aerosol/Combustion Synthesis of Unagglomerated Yttria Nanoparticles (in conjunction with Center for Nanoscience and Nanobiotechnology)	DOD/Air Force	4/30/2007	1/31/2008	\$70,000
Moustakas, Theodore	Low-Cost Blue/UV LEDs with Very High Photon Conversion and Extraction Efficiency for White Lighting	DOE	10/1/2006	9/30/2007	\$85,000
Moustakas, Theodore	Low-Cost Blue/UV LEDs with Very High Photon Conversion and Extraction Efficiency for White Lighting	DOE	10/1/2006	9/30/2007	\$80,000
Moustakas, Theodore	Low-Cost Blue/UV LEDs with Very High Photon Conversion and Extraction Efficiency for White Lighting	DOE	10/1/2006	9/30/2007	\$154,995
Moustakas, Theodore	Photonics Technology Development and Insertion/Task 6: Development of GaN Substrates by HVPE to be Used by Both BU and ARL Groups for Fabrication of UV-LEDs for Biological and Chemical Detection (Photonics Center Award)	DOD/Army	5/1/2005	10/31/2006	\$273,000
Moustakas, Theodore	Deep UV Semiconductor Laser for in situ Organic and Biological Exploration (see source #9207-5) (Subcontract via Photon Systems, Inc.)	NASA	1/1/2006	12/31/2008	\$125,000
Moustakas, Theodore	Green LED Research (Subcontract via University of Nevada/Las Vegas Research Foundation)	DOE	8/1/2006	7/31/2007	\$350,000
Moustakas, Theodore	Nitridation Studies of Sapphire Wafers	Saint-Gobain Ceramics	12/12/2006	3/15/2007	\$10,000
Paiella, Roberto	Plasmonic Band-Structure Engineering for Light-Emission Efficiency Enhancement	DOE	8/15/2006	8/14/2007	\$104,897
Paiella, Roberto Moustakas, Theodore	Intersubband All-Optical Switching and Optically-Pumped Light Emission with III-Nitride Quantum Wells	NSF	9/1/2007	8/31/2008	\$90,426
Paiella, Roberto Moustakas, Theodore	Intersubband All-Optical Switching and Optically-Pumped Light Emission with III-Nitride Quantum Wells	NSF	9/1/2006	8/31/2007	\$95,649
Ruane, Michael	Center for Subsurface Sensing and Imaging Systems (CenSSIS) -- Education Program (Subcontract via Northeastern Univ.)	NSF	9/1/2006	8/31/2007	\$58,942
Ruane, Michael	REU Site: Research Experience for Undergraduate Students in Photonics	NSF	5/1/2007	4/30/2008	\$114,053
Saleh, Bahaa	Center for Subsurface Sensing and Imaging Systems (CenSSIS) -- Research Thrust 1-Photonics (Subcontract via Northeastern Univ.)	NSF	9/1/2006	8/31/2007	\$124,865
Saleh, Bahaa Teich, Malvin C	Quantum Optical Coherence Tomography (CenSSIS Supplement) (Subcontract via Northeastern University)	NSF	2/1/2003	8/31/2007	\$35,000
Saleh, Bahaa Teich, Malvin C. Sergienko, Alexander V	Quantum Imaging: New Methods and Applications (MURI) (Subcontract via University of Rochester)	DOD/Army	5/1/2005	9/30/2007	\$210,673
Saligrama, Venkatesh	CAREER: A Systems Approach to Networked Decision Making in Uncertain Environments (in conjunction with Center for Information and Systems Engineering)	NSF	6/1/2005	5/31/2008	\$80,000

RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END	AMOUNT
Saligrama, Venkatesh	Networked Sensing Systems for Urban Target Recognition (in conjunction with Center for Information and Systems Engineering)	DOD/Navy	12/31/2005	12/30/2007	\$76,000
Semeter, Joshua	Ground-Based Investigation of Upflowing Ions in the Discrete Aurora (in conjunction with Center for Space Physics)	NSF	1/1/2007	12/31/2007	\$80,100
Semeter, Joshua	AMISR Graduate Studies: Development of Multi-Sensor Analysis Techniques and a Synergistic Educational Program (in conjunction with Center for Space Physics)	NSF	1/1/2007	12/31/2007	\$74,463
Semeter, Joshua	CAREER: Magnetosphere-Ionosphere Coupling Through Multi-Sensor Data Fusion	NSF	5/1/2007	4/30/2008	\$78,219
Semeter, Joshua	SGER: Field-Test of a Prototype Giant Magneto-Impedance Magnetometer	NSF	10/1/2006	9/30/2007	\$50,000
Semeter, Joshua Karl, W. Clement	AMISR Graduate Studies: Development of Multi-Sensor Analysis Techniques and a Synergistic Educational Program	NSF	1/1/2007	12/31/2007	\$21,531
Teich, Malvin	Free Space Quantum Key Distribution (T. Yarnall) (Subcontract via MIT/Lincoln Laboratory)	DOD/Air Force	9/1/2006	12/31/2006	\$15,358
Teich, Malvin	Free Space Quantum Key Distribution (T. Yarnall) (Subcontract via MIT/Lincoln Laboratory)	DOD/Air Force	1/1/2007	5/31/2007	\$19,198
Unlu, M. Selim	Design, Fabrication and Bench Testing of the FLAMES (in conjunction with Center for Nanoscience and Nanobiotechnology) (Subcontract via New Jersey Institute of Technology)	HHS/NIH/NINDS	9/20/2005	8/31/2007	\$53,216
Unlu, M. Selim	High-Throughput, Label-Free Promoter Sequence Discovery	HHS/NIH/NIGMS	7/1/2007	6/30/2008	\$197,234
Unlu, M. Selim Goldberg, Bennett	New Instrumentation for Nanoscale Subsurface Spectroscopy and Tomography (in conjunction with Center for Nanoscience and Nanobiotechnology) (Subcontract via University of Rochester)	DOD/Air Force	6/15/2003	1/14/2007	\$72,500
Unlu, M. Selim Goldberg, Bennett	New Instrumentation for Nanoscale Subsurface Spectroscopy and Tomography (Subcontract via University of Rochester) (see source #8281-5)	DOD/Air Force	6/15/2003	1/14/2008	\$107,154
SUBTOTAL	GRANTS WITH ECE PIs				\$4,582,244

New Grants with ECE co-PIs

RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END	AMOUNT
Bifano, Thomas Bellotti, Enrico Castanon, David A Dal Negro, Luca Hubbard, Allyn E Morse, Theodore Moustakas, Theodore Paiella, Roberto Swan, Anna Unlu, M. Selim	Photonics Research and Technology Insertion (\$7,940,000)	DOD/Army	7/1/2006	6/30/2007	\$71,969 \$158,952 \$102,015 \$465,878 \$106,635 \$150,656 \$111,960 \$65,467 \$162,305
Brower, Richard Rebbi, Claudio	Collaborative Research: National Computational Infrastructure for Lattice Gauge Theory (\$183,350)	DOE	3/15/2007	3/14/2008	\$91,675
Lane, Kenneth Brower, Richard Cohen, Andrew Rebbi, Claudio Pi, So Young	Research in Particle Physics, Task E: Theoretical Particle Physics (\$40,000)	DOE	2/1/2006	1/31/2007	\$6,667
Brower, Richard Rebbi, Claudio	Collaborative Research: National Computational Infrastructure for Lattice Gauge Theory (\$88,150)	DOE	9/15/2006	3/14/2007	\$44,075
Lane, Kenneth Brower, Richard Cohen, Andrew Rebbi, Claudio Pi, So Young Katz, Emanuel	Research in Particle Physics, Task E: Theoretical Particle Physics (\$550,000)	DOE	2/1/2007	1/31/2008	\$91,667
Baillieul, John Castanon, David	Behavioral Dynamics in the Cooperative Control of Mixed Human/Robotic Teams (MURI-07) (in conjunction with Center for Information and Systems Engineering) (\$993,085)	DOD/Air Force	5/1/2007	11/30/2007	\$496,543
Rebbi, Claudio Coker, David Caramanis, Michael Giles, Roscoe Grossberg, Stephen	IGERT: Multidisciplinary Approach to the Integration of High-Performance Computing in Science Education (\$539,197)	NSF	12/1/2006	11/30/2007	\$107,839
Giles, Roscoe Holmes, Raquell M.	BPC-A - Empowering Leadership: Computing Scholars of Tomorrow (Subcontract via Rice University) (\$42,499)	NSF	3/1/2007	2/29/2008	\$21,250
Rebbi, Claudio Coker, David Caramanis, Michael Giles, Roscoe Grossberg, Stephen	IGERT: Multidisciplinary Approach to the Integration of High-Performance Computing in Science Education (\$211,140)	NSF	12/1/2005	11/30/2007	\$42,228
Campbell, David Horenstein, Mark Erskine, Mary	No Longer a Dream Deferred: Greater Minority STEM Participation Through Academic and Institutional Change (Subcontract via UMass/Amherst) (\$85,600)	NSF	3/1/2006	2/28/2007	\$11,887
Campbell, David Horenstein, Mark Erskine, Mary	No Longer a Dream Deferred: Greater Minority STEM Participation Through Academic and Institutional Change (Subcontract via UMass/Amherst) (\$46,500)	NSF	3/1/2006	2/28/2007	\$11,887
Mountain, David Hubbard, Allyn	Active Filtering in the Cochlea (In conjunction with the Hearing Research Center) (\$494,293)	HHS/NIH/NIDCD	7/1/2007	6/30/2008	\$82,399
DeLuca, Carlo Nawab, S. Hamid	Wearable-Sensor System for Monitoring Motor Function (\$619,987)	HHS/NIH/NIBIB	9/6/2006	8/31/2007	\$150,000

RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END	AMOUNT
DeLuca, Carlo Roy, Serge Nawab, S. Hamid Adam, Alexander	Harnessing Motoneuron Activity: From Lab to Clinic (\$557,233)	HHS/NIH/NICHD	6/1/2007	5/31/2008	\$150,000
Goldberg, Bennett Unlu, M. Selim	MURI: New Instrumentation for Nanoscale Subsurface Spectroscopy and Tomography (Subcontract via University of Rochester) (see source 8280-5) (\$72,846)	DOD/Air Force	6/15/2003	1/14/2008	\$36,423
Subtotal	Grants With ECE PIs				\$2,740,377
GRAND TOTAL					\$7,322,621



Professor Thomas Little

Continuing Grants & Contracts, FY06

RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END
Alanyali, Murat	CAREER: Scalable Architecture for Self-Managed Networks	NSF	7/1/2003	7/31/2008
Alanyali, Murat Saligrama, Venkatesh	Distributed Methods for Statistical Decision Making in Networked Environments REU Supplement	NSF	8/1/2004	7/31/2008
Alanyali, Murat Saligrama, Venkatesh	Distributed Methods for Statistical Decision Making in Networked Environments	NSF	8/1/2004	7/31/2008
Bellotti, Enrico	CAREER: Theoretical Investigation of Single Photon Detectors for Quantum Technology	NSF	5/1/2005	4/30/2010
Bigio, Irving J.	Graduate Student Support: N. Kunapareddy	LANL/DOE	6/1/2005	2/28/2007
Castanon, David	Center for Subsurface Sensing and Imaging Systems (CenSSIS) Research Thrust 2 (Subcontract via Northwestern University)	NSF		
Herbordt, Martin	Exploratory/Development Grant: FPGA-Based Computational Accelerators	PHS/NIH/NCRR	7/1/2004	6/30/2007
Ishwar, Prakash	CARRER: Information-Scaling Laws, "Bit-Conversion" Principles, and Robust Coding Architectures in Sensor Networks	NSF	12/15/2005	11/30/2007
Karl, W. Clement	Foundation in Automatic Target Recognition	AFOSR	9/1/2003	8/31/2006
Karl, W. Clement	Anatomic Morphologic Analysis of MR Brain Images	PHS/NIH/NINDS	9/1/2005	8/31/2007
Karpovsky, Mark Taubin, Alexander	Cryptographic Devices Resistant to Attacks: Design Methodology Based on Robust Codes, Asynchronous Circuitry, and Multi-Valued Logic Technology	MoniBase Logic	5/26/2005	8/31/2006
Konrad, Janusz	US-France Cooperative Research: Segmentation and Reconstruction of Scenes with Dynamic Objects	NSF	5/1/2003	10/31/2006
Kotiuga, P. Robert	Advanced Computational Magnetism - ACE '06 Workshop (In conjunction with the Center for Computational Science)	NSF	4/1/2006	3/31/2007
Little, Thomas Alanyali, Murat Kunz, Thomas Phillips, Nathan Saligrama, Venkatesh	NetS-NOSS: Semantic Internetworking of Sensor Systems for Efficient In-Network Information Processing	NSF	1/1/2005	12/31/2007
Little, Thomas Alanyali, Murat Kunz, Thomas Phillips, Nathan Saligrama, Venkatesh	REU Supplement: NetS-NOSS: Semantic Internetworking of Sensor Systems for Efficient In-Network Information Processing	NSF	1/1/2005	12/31/2007
Morse, Theodore	Ultra-Sensitive Biodetection Using Whispering Gallery Spheres and Intra-Cavity Polarization Mode Beating (PMB)	NSF	9/1/2004	8/31/2007
Moustakas, Theodore	Deep Ultraviolet Laser Diode for UV Resonance Enhanced Raman Identification of Biological Agents	Photonix/DARPA	2/15/2004	2/15/2006
Moustakas, Theodore	Low-Cost Blue/UV LEDs with Very High Photon Conversion and Extraction Efficiency for White Lighting	NETL/DOE	9/1/2004	9/30/2007
Moustakas, Theodore	Novel GAN HBT for Advanced T/R Modules for X-Band Radar Performance Enhancement	Photonix/AFOSR	9/27/2004	9/29/2006
Moustakas, Theodore	Comparative Studies of UV LEDs Emitting at 280 nm Grown Along Polar and Non-Polar Direction of AlN Substrates and Templates	AFRL	5/10/2005	8/10/2006
Oliver, William	REU Supplement: Incoherent Scatter Radar Studies of Hot Oxygen	NSF	11/15/2003	10/31/2006

RECIPIENT	TITLE OF AWARD	SOURCE	BEGIN	END
Oliver, William	Incoherent Scatter Radar Studies of Hot Oxygen (In conjunction with the Center for Space Physics)	NSF	11/15/2005	10/31/2007
Roy, Ronald	Enhancement and Control of Remote Acoustic Hemostasis and Focused Ultrasonic Surgery by Acoustic Cavitation	NEU/CenSSIS Industrial	5/1/2003	5/31/2007
Saligrama, Venkatesh	Workshop on Networked Sensing, Information and Control (Boston, MA Winter 2006)	NSF	9/15/2005	8/31/2006
Semeter, Joshua	Ground-Based Investigation of Upflowing Ions in the Discrete Aurora (In conjunction with the Center for Space Physics)	NSF	1/1/2004	12/31/2007
Sergienko, Alexander Saleh, Bahaa Teich, Malvin	ITR - Integrated Source of High-Fidelity Entangled States for Quantum Information Processing	NSF	9/1/2003	8/31/2007
Starobinski, David	CAREER: Quality of Service Engineering with Multiple Time-Scale Traffic	NSF	8/1/2002	7/31/2008
Starobinski, David	CAREER: Quality of Service Engineering with Multiple Time-Scale Traffic (REU)	NSF	5/1/2003	7/31/2008
Starobinski, David	A Theory of Stability for Communication Networks	DOE	8/1/2004	8/14/2008
Starobinski, David	NeTS-NOSS: SensorNet Architecture for Indoor Location Detection: From Resolution to Robustness	NSF	9/1/2004	8/31/2008
Starobinski, David	REU Supplement: NeTS-NOSS: SensorNet Architecture for Indoor Location Detection: From Resolution to Robustness	NSF	9/1/2004	8/31/2008
Swan, Anna	Nanometer Resolution Spectral Self-Interference Fluorescence Microscopy	NSF	5/1/2002	4/30/2007
Swan, Anna	Nanometer Resolution Spectral Self-Interference Fluorescence Microscopy (REU & travel)	NSF	5/1/2002	4/30/2007
Swan, Anna	4 Schools for WIE	NEU/NSF	12/15/2002	10/31/2006
Teich, Malvin	Functional Imaging of Synapses by Entangled-Photon Microscopy	Packard Fdn	8/1/1999	8/31/2006
Trachtenberg, Ari	CAREER: Practical Data Synchronization: Minimizing Communication	NSF	2/1/2002	1/31/2008
Trachtenberg, Ari	A Scalable Middleware for Data Reconciliation in PDAs and Mobile Networks	NSF	6/1/2003	5/31/2007
Unlu, M. Selim	NIRT: Advanced Characterization Technique in Optics for Nanostructure (ACTION)	NSF	10/1/2002	9/30/2007
Unlu, M. Selim	MOCVD Growth of GaAs Wafers for Heterojunction Bipolar Transistors	Kopin Co./NSF	7/1/2005	8/31/2006
Unlu, M. Selim Anna Swan Bennett Goldberg Charles DeLisi	IRES: US-Turkey-Switzerland Collaboration on Resonant Structures for Biosensing and Imaging (In conjunction with the Center for Nanoscience and Nanotechnology)	NSF	5/1/2006	4/30/2009

6.1 Mission and Vision

The Department of Electrical and Computer Engineering (ECE) at Boston University is a medium-size Research-I department with a current enrollment of 244 BS, 82 MS, and 106 PhD students. The Department offers BS, MS and PhD degree programs in Electrical Engineering (EE) and Computer Systems Engineering (CSE) and a MS degree in Photonics. Both undergraduate programs are accredited by ABET. The Department has 43.5 FTE faculty, who earned approximately \$7.3M of new grants and contracts this year. The Departmental facilities occupy about 55,000 sq. ft. in the Photonics Building.

ECE is a multidisciplinary department, with a strong systems perspective. There are three overlapping areas of research and instruction: Electrophysics, 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 have collegial ties to important Boston University research centers, most notably the Photonics Center, the Center for Nanoscience and Nanobiotechnology (CNN), the Center for Information Systems and Engineering (CISE), the Center for Computational Science, the Center for Space Physics, the Center for Subsurface Sensing and Imaging Systems (CenSSIS), and the Center for Cognitive and Neural Systems. We also have strong links with several other departments at Boston University (See Fig.1). Many faculty members pursue collaborative cross-disciplinary research with faculty in other Boston University departments and have strong extramural ties in larger centers, multi-university initiatives, and industry collaboratives.

Electrical engineering and computer systems engineering are fundamental technology disciplines. They address challenging research problems, support important applications, and offer strong opportunities for business development. Innovations from electrical and computer engineering define modern society and support much of the world's high-tech economy. Personal computers, cellular phones, fiber optics communications and the Internet, medical imaging systems, digital CDs and DVDs, laser materials processing, new energy sources, and modern defense systems are just a few of the many technologies arising from electrical and computer systems engineering.

Electrical engineering and computer systems engineering are also enabling disciplines. They are critical to the development of virtually every

field of science, technology, and medicine. Electronic instrumentation for measurements on scales from nanometers to light years, environmental monitoring of pollution, land use and global warming; automatic control systems for industry and transportation; data communications for people, corporations, and governments; and computer modeling for economics, DNA, weather, and security are examples of how we support broad areas of inquiry and contributions to human knowledge and welfare.

Electrical and computer systems engineering have special significance and relevance as key technologies for the 21st century, where information and systems sciences will be vital to the solution of the significant problems facing society. Other areas of the university benefit from the technologies and training we provide to research, education, and outreach. The Massachusetts economy, especially along Route 128/I-93, is strongly dependent on companies and industries rooted in electrical and computer systems engineering. Even the financial services economy of Boston relies on information sciences, communications, and computer systems supported by the disciplines we address. Finally, efficient, effective intelligence and defense systems increasingly rely on electrical and computer systems engineering innovations to collect data and project force in lieu of putting soldiers and military assets directly at risk.

The ECE Department has attracted outstanding students and faculty, instituted major centers, and built an excellent reputation in the professional community. ECE Ph.D. students have earned numerous Dean's Fellowships and prestigious external fellowships from NSF, DARPA and the Gates Foundation. Most of the ECE junior faculty have been recognized with CAREER awards and/or ONR Young Investigator awards, and many of the senior faculty are world-renowned figures in their fields.

Our overall strategy for creating a prominent program in education, research, and outreach is to continue to focus on a few important interdisciplinary areas of excellence that will create outstanding programs of research and innovation while contributing to a strong undergraduate learning experience and cutting edge graduate research. This will require faculty stability and growth and continued University support for curriculum and laboratory development.

Plans for faculty growth (and replacements in response to attrition) have been motivated by the need to strengthen existing research areas to become more competitive at a national level, develop new expertise to keep up with the rapidly changing face of the profession and to play

a leading role in shaping future technological advances, and respond to shifting and growing student enrollments at both the undergraduate and graduate levels. We also aim to exploit the synergies between our existing research areas as well as links with other departments and centers at Boston University. We expect a strong rebound in high tech over the next five years, and plan to invest wisely now to benefit from these coming opportunities. The continued excellence of our faculty and students will lead to the increased prominence desired for Boston University's ECE Department.

The mission of the ECE Department is:

1. To educate our students to meet high standards of excellence in electrical and computer engineering in preparation for professional careers and advanced studies.
2. To create and disseminate new knowledge through basic and applied research in electrical and computer engineering.
3. To serve as a resource of electrical and computer engineering expertise at the local, regional, and national levels.

Figure 2. History of BS, MS, and PhD Student Enrollment

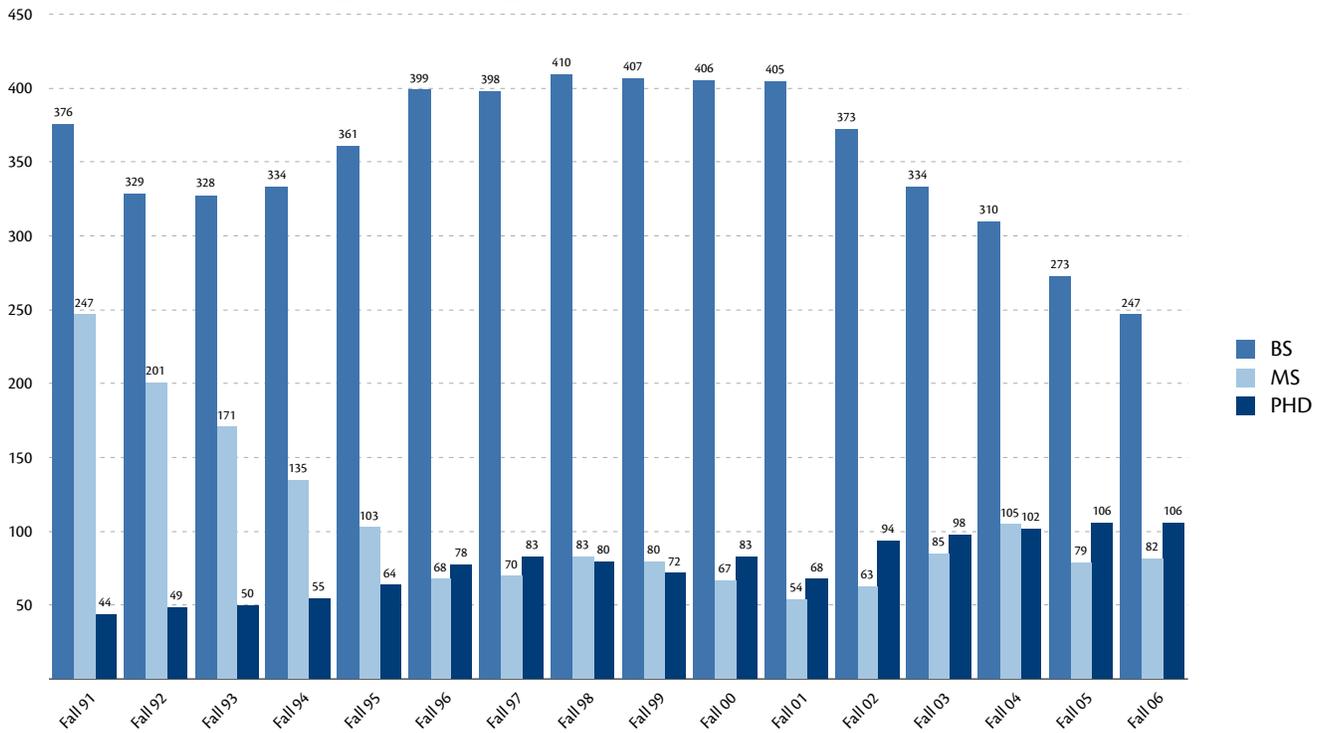


Figure 3. EE and CSE Undergraduate Enrollment Statistics

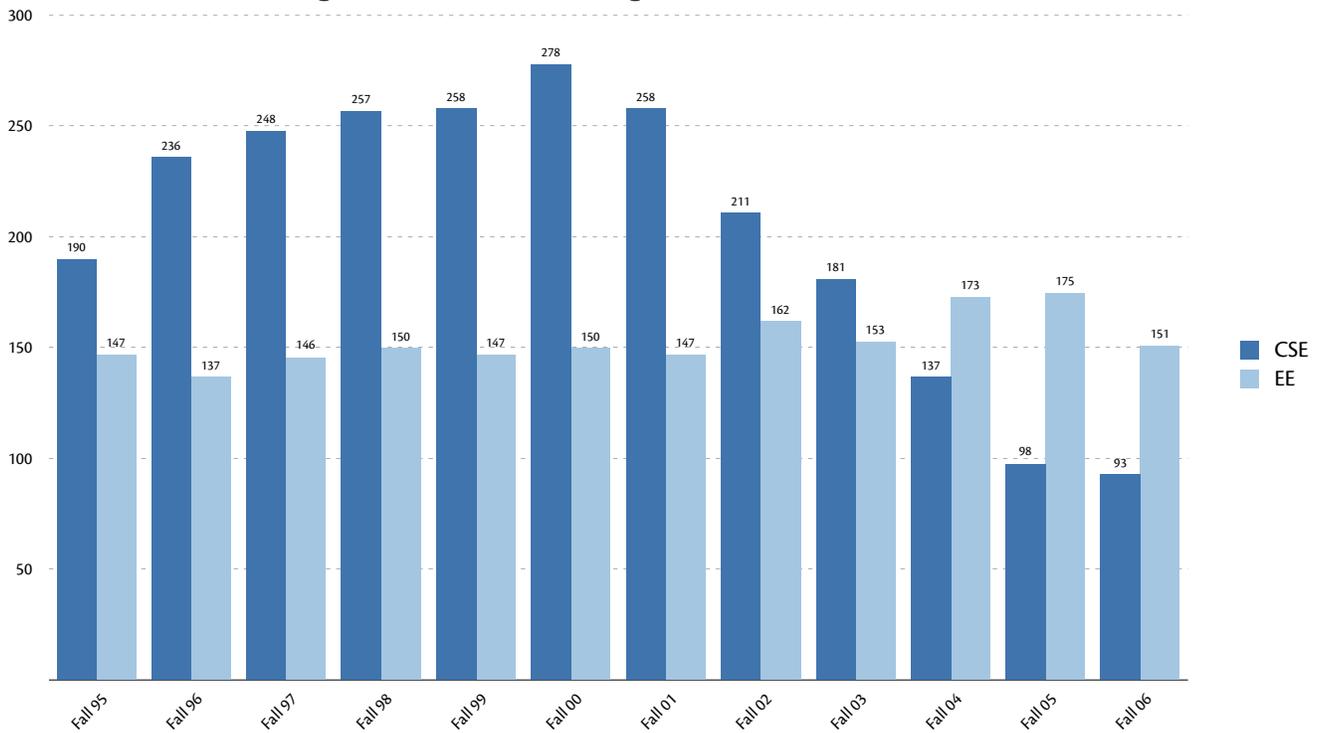


Figure 4. History of Degrees Awarded

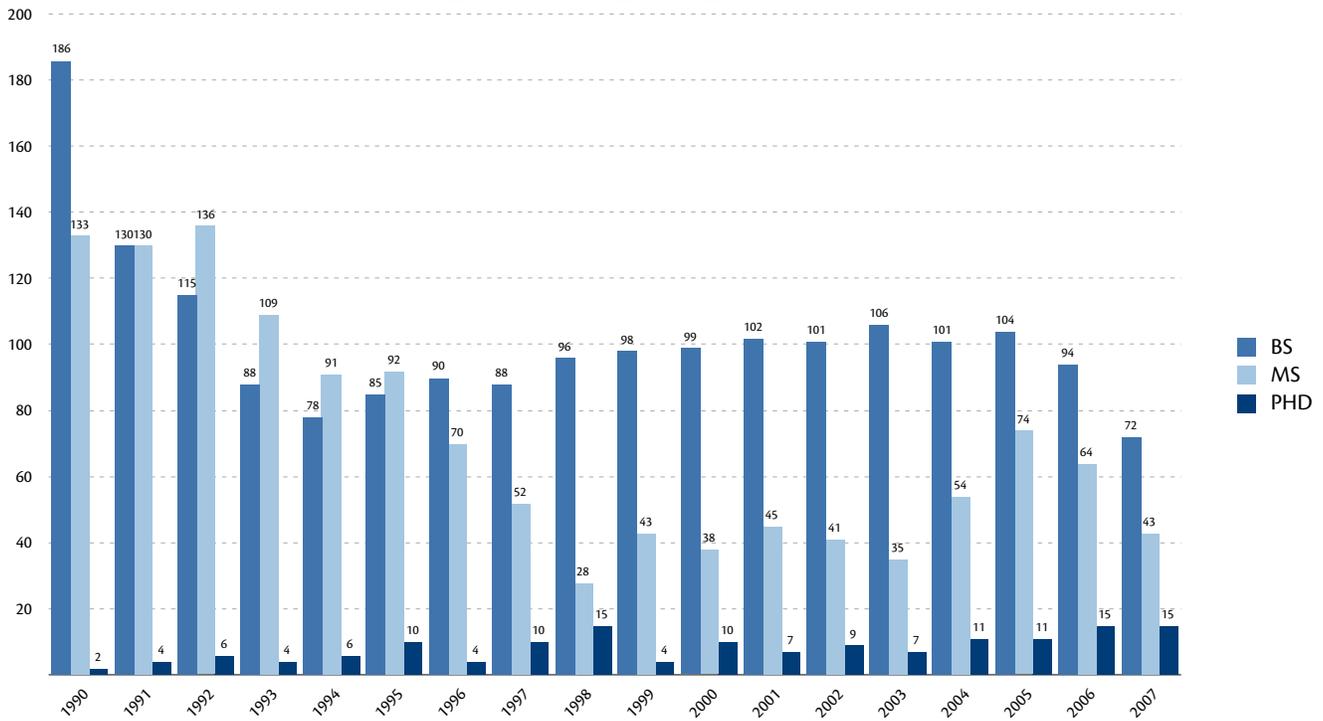
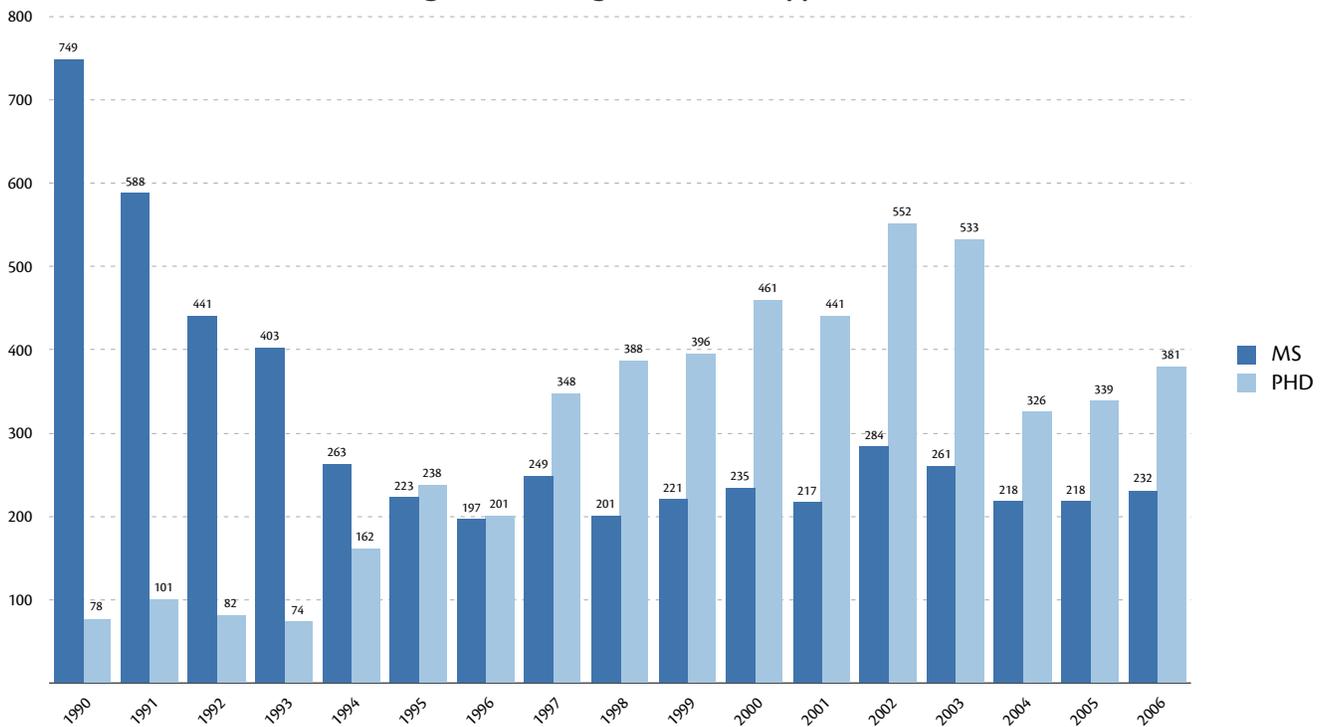


Figure 5. History of Graduate Applications



B. Faculty and Staff

The size of the faculty has increased from 32 in the early 1990s to an average of approximately 36 FTEs in the 1996-2003 period and is now 43.5 FTE, as displayed in Fig. 6. This net growth has been achieved despite some faculty attrition caused by retirement, non-renewal of inactive faculty, and competition from other institutions that made attractive offers to some of our successful faculty. Maintaining the size of the department and achieving a small net growth in certain strategic areas continues to be a goal of this department.

Research funding has grown significantly in the last decade. Total an-

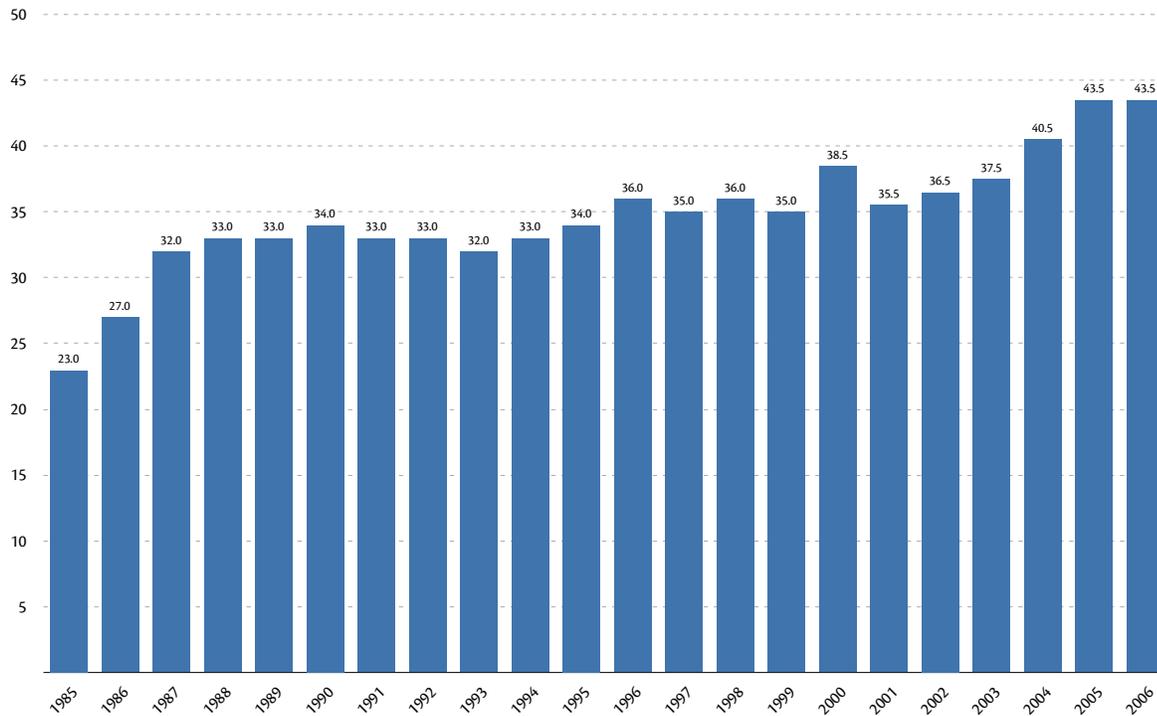
nual new research funding in the last five years averaged to approximately \$7.3M, compared to \$5.2M in the 1996-00 period, and \$2.4M in 1990-95.

Staff development has improved in response to faculty size, research volume, and programmatic changes. Scientific staff (research faculty, post-docs, visiting scholars) has increased with associated space and administrative demands, but the technical lab staff positions have remained steady. A new staff position has been added in the area of publications, new media, and promotions.



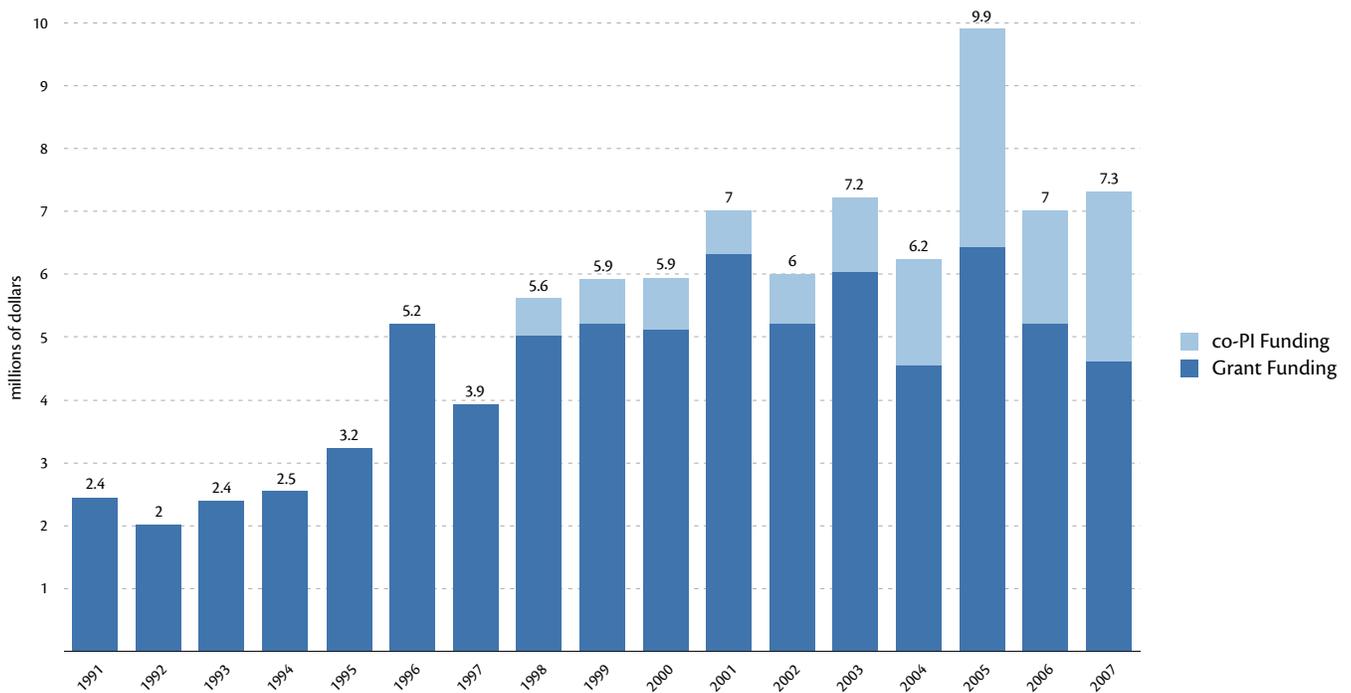
The Photonics Center building at Boston University, home of the Department of Electrical & Computer Engineering

Figure 6. Number of Faculty



Affiliate faculty and research faculty with no teaching responsibilities are not included in this chart. Teaching faculty without an active research program are included.

Figure 7. New Research Grants & Contracts



Dark-blue bars represent grants and contracts for which the principal investigators were ECE faculty; light-blue bars represent the share of ECE faculty in grants and contracts for which the PI are from other departments.

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Department of Electrical & Computer Engineering
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