BOSTON UNIVERSITY

Department of Electrical and Computer Engineering

2000 - 2001

Annual Report

July 1, 2000 - June 30, 2001

www.bu.edu/ece

Contents

1. Highlights

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 2000-2001 academic year. The instructional activities reported are for the Fall 2000, Spring 2001, and Summer 2001 semesters. Publications and scholarly activities, as well as budget information, are reported for the 2001 fiscal year (July 1, 2000 to June 30, 2001). Key data for this year are also compared to previous years to show progress and identify trends. Please refer to the Department's website (www.bu.edu/ece) for more information on ECE's recent activities.

Faculty

Four new full-time faculty joined the ECE Department in September 2000. **Enrico Bellotti**, appointed as Assistant Professor, received the Ph.D. from Georgia Institute of Technology in 1999. His research interests include semiconductor materials, device design and simulation (See sidebar). **Janusz Konrad**, who received the Ph.D. from McGill University in 1989, was appointed as Associate Professor. Previously, he served on the faculty of INRS-Télécommunications, Verdun, Quebec, Canada. His area of research is image/video processing, steroscopic and 3-D imaging, and multimedia systems (See sidebar on page 1-2). **David Starobinski**, appointed as Assistant Professor, received the Ph.D. from the Electrical Engineering Department at the Technion, Israel Institute of Technology in 1999, and was a post-doctoral fellow at the Electrical Engineering and Computer Science Department, University of California-Berkeley. His research interests include high-speed communication networks and wireless cellular networks (See sidebar on page 1-2). **Ari Trachtenberg**, appointed as Assistant Professor, received the Ph.D., in 2000, from the Department of Computer Science at the University of Illinois, Urbana-Champaign. His research interests include error correcting codes, cryptography, algorithms, approximations, computation, and visualization (See sidebar on page 1-2).

In January 2001, **Irving Bigio** was appointed Professor of Biomedical Engineering and ECE. He received the Ph.D. from the University of Michigan in 1974. His research interests include: medical application of optics, lasers, and spectroscopy; biophotonics; applied spectroscopy; nonlinear optics, quantum electronics, and laser physics (See sidebar on page 1-2). In Fall 2000, **David Campbell** became Dean of the College of Engineering, and he was also appointed Professor of ECE. His research interests include: general nonlinear phenomena and complex systems; novel electronic materials, including conducting polymers and organic and high Tc superconductors; and electron transport in semiconductor superlattices (See sidebar on page 1-3). In addition, **Tommaso Toffoli's** status changed from Research Associate Professor to Associate Professor, tenure track. He remained active in teaching in the area of computer engineering while pursuing his main research interests in fundamental connections between physics and computation; fine-grained modeling of physics-like systems technology (cellular automata machines) and methodology (programmable matter); and personal knowledge structuring (See sidebar on page 1-3).

The Department continued its vigorous efforts to recruit new faculty in selected strategic areas. From this extensive search, Dr. Martin Herbordt and Dr. Saligrama Venkatesh will join the ECE Department beginning in September 2001. **Martin Herbordt**

Enrico Bellotti was appointed as Assistant Professor. Born in Italy, he received the "Laurea in Ingegneria Electronica" from Politecnico di Milano, Milano, Italy, in 1989. From 1991 to 1993, he worked with Schlumberger Industries, Italy, developing digital communication systems, energy management products, and planar magnetic devices. In 1994, he joined Advanced Meter Reading Technology (AMRT), a joint venture partnership between Schlumberger Industries and Motorola Inc. While at AMRT, he was involved in the design of wireless communication systems. From 1996 to 1999, he was with the Computational Electronics Group, at Georgia Tech, in Atlanta, working toward the Ph.D. degree in electrical engineering. His dissertation work was in field of wide band gap semiconductor materials and devices. From July 1999 to March 2000, he held a position of Research Engineer with the Microelectronics Research Center at Georgia Tech. From April to August 2000, he was with Mid-Sweden University, in Sundsvall Sweden, as visiting professor. His research interests include the physics and transport properties of wide band gap semiconductors, electronic structure calculation of novel semiconductor materials, physical simulation of power semiconductor devices, lasers and photo detectors. He has also done research in planar magnetic devices, wireless communication systems and photon transport in biological tissues.

Janusz Konrad was appointed as Associate Professor in September 2000. He received the Ph.D. degree in Electrical Engineering with distinction from McGill University, Montreal, Canada in 1989. From 1989 to 1991 he was a research associate at INRS-Telecommunications, Montreal, a research centre within the Institut National de la Recherche Scientifique (University of Quebec). In 1991, he joined the faculty at INRS-Telecommunications as an Assistant Professor, and in 1992 he was appointed to the rank of Associate Professor. From 1993 to 1999 he was also an Adjunct Professor in the Department of Electrical Engineering of McGill University. In 1997-98, he was a visiting scientist at the Cambridge Research Laboratory, Digital Equipment Corp. and at the Department of Electrical and Computer Engineering, Boston University. His research interests include image/video processing and compression, stereoscopic and 3-D imaging, multidimensional digital signal processing, multimedia systems, and computer vision. He is a senior member of the IEEE and a member of the Image and Multidimensional Digital Signal Processing Technical Committee of the IEEE. He is currently an Associate Technical Editor of the IEEE Communications Magazine. From 1996 to 2000 he was an Associate Editor of the IEEE Transactions on Image Processing. He is also the Technical Program Co-Chair of the IEEE International Conference on Image Processing, ICIP-2000 (Sept. 2000, Vancouver) and he is on the organizing committee of the IEEE International Conference on Acoustics, Speech and Signal Processing, ICASSP-2004 (May 2004, Montreal, Canada).

Ari Trachtenberg, born in Haifa, Israel, was appointed Assistant Professor in September 2000. He received the S.B. degree in mathematics with computer science from the Massachusetts Institute of Technology in 1994, and the M.S. and Ph.D. degrees in computer science from the University of Illinois at Urbana-Champaign in 1996 and 2000 respectively. At the University of Illinois he was a University Fellow and later a Computational Science and Engineering Fellow. During the summer of 1997, he was a research intern at the Hewlett Packard Laboratories, and more recently he was an summer instructor with the Center for Talented Youth at the Johns Hopkins University. Before coming to Boston University, he was a visiting lecturer with the department of computer science at the University of Illinois. He was awarded the Mavis Memorial Fund Scholarship for academic performance, engineering education, and published research in 1999, and the Kuck award for outstanding Ph.D. thesis in 2000. His research interests include coding theory, distributed systems, cryptography, and algorithms.

received the Ph.D. from the University of Massachusetts in 1994. Since then, he has been on the faculty of the Department of ECE at the University of Houston, Texas. He also served as Associate Director of Operations at the Center for Computation and Information Sciences. He was promoted to Associate Professor in September 2000. He will join the ECE Department in September 2001 as Associate Professor His research interests include: web cache architecture, design of switches for multicomputer networks, architectures for computer vision, and architecture-level design automation. **Saligrama Venkatesh** received the Ph.D. from the Massachusetts Institute of Technology in 1997. He was a member of the research staff at United Technologies Research Center from 1997 to 2000, and will be joining our Department as an Assistant Professor in September 2001. His recent research work includes: sensor array processing for acoustic imaging, and design of adaptive echo-cancellation in a controlled environment.

Professor Richard Vidale and **Professor David Perreault** retired at the end of the 2000-2001 school year. This marked the 37th year of Prof. Vidale's teaching career and the 26th year of Prof. Perreault's teaching career. Both have been named emeritus faculty for next year and they expect to provide occasional service for years to come. Other departures at the end of this past year include: **Professor Truong Nguyen**, who will join the ECE faculty at the University of California, San Diego; **Professor Johannes Smits**, who will pursue research work with G.S.I. Lumonics, Inc.; **Professor Carol Espy-Wilson**, who will join the ECE faculty at the University of Maryland; and **Professors Dimiter Aversky** and **Neeraj Suri**.

David Starobinski was appointed as Assistant Professor in September 2000. He received the B.Sc., M.Sc., and Ph.D. degrees, all in Electrical Engineering, from the Technion-Israel Institute of Technology, in 1993, 1996, and 1999, respectively. From 1993 to 1999, he was a research assistant at the Technion and served as a lecturer, teaching assistant and project supervisor. In 1996, he was a summer intern in the research laboratories of Sun Microsystems Corp., Mountain View, California. Since 1999, he has been a post-doctoral fellow in the EECS Department at UC Berkeley, where he was supported by a fellowship from the Swiss National Science Foundation. His research interests are in the design and evaluation of World Wide Web protocols, Internet traffic engineering, and application of stochastic processes theory to high-speed and wireless networks. Dr. Starobinski received prizes from the Gutwirth Foundation and Intel Corp. in recognition of his outstanding academic achievements.

Irving Bigio was appointed Professor of Biomedical Engineering and ECE. He received the Ph.D. in Physics from the University of Michigan in 1974. Since 1988, he has worked at the Los Alamos National Laboratory as Leader of the Laser Science & Applications Group, Senior Scientist of the Bioscience & Biotechnology Group, and Member of the Core Scientific Leadership Team (Bioscience Division). His research interests include: medical applications of optics, lasers, and spectroscopy; biophotonics; applied spectroscopy; nonlinear optics, quantum electronics, and laser physics. Dr. Bigio is a Fellow of the Optical Society of America and the American Society for Lasers in Medicine and Surgery.

David Campbell became Dean of the College of Engineering and was also appointed Professor. He received his bachelor's degree in physics and chemistry from Harvard College in 1966, Part III Mathematics Tripos, with distinction, from Cambridge University in 1967, and his Ph.D. in theoretical physics and applied mathematics from Cambridge in 1970. He has pioneered the systematic study of inherently nonlinear phenomena throughout physics. The central theme of his work is the role of nonlinear excitations--solitons--in novel states of matter. His contributions span many distinct subfields of physics from high-energy field theory to condensed matter. He is a leader in the emerging field of non-linear science. His influential overview articles and his direction of the flag-ship journal, *Chaos*, of which he was the founding editor, have established key interdisciplinary organizing principles--the paradigms of solitons, chaos, and patterns--and have played a seminal role in defining the research agenda in nonlinear science. He is a Fellow of the American Physical Society and the American Association for the Advancement of Science. He continues to be the Editor-in-Chief of *Chaos* and Editor of *Physics Reports*.

Tommaso Toffoli's appointment was changed this year from Research Associate Professor to the tenure-track ladder at the rank of Associate Professor. He received the Doctor of Physics degree from the University of Rome in 1967 and the Ph.D. in Computer and Communication Sciences from the University of Michigan in 1977 He joined BU in 1995, after a period of 17 years at the MIT Laboratory for Computer Science. He has pioneered the well-known CAM-2 to CAM-8 series of cellular automata machines. He is also internationally renowned for his work on the Theory of cellular automata, fine-grained architectures for massively parallel computation, and personal knowledge structuring. He is a co-author of Cellular Automata Machines, MIT Press, 1987.

Awards and Honors

Charles R. Eddy, Jr. was elected to Executive Committee of the Electronic Materials and Processing Division of the American Vacuum Society.

Jeffrey Carruthers received the 2000/01 ECE Teaching Excellence Award from the Department. (See page 3-3)

Alexander Sergienko received the 2001 Professor of the Year Award from the College of Engineeering.

Matthew Dawson and **Darin Hitchings** received the 2000/01 ECE Graduate Teaching Fellow of the Year Award.

For the second year in a row, an ECE student team, supervised by **Michael Ruane** and **Ronald Knepper**, received Honorable Mention and $1000 at the finals of the IEEE Computer Society International Design Contest (CSIDC-2001) held in Washington, DC. The team, iShop, consisted of ECE students **Aaron Caine, Leo Kwong, Joseph Russavage, Andrew Turley**, and **Bingzhen Zou**. The team developed their project in Senior Design during the spring 2001 semester The design competition involved Bluetooth communications technology, with Bluetooth development hardware donated by Ericsson. Team iShop created a system for wireless Bluetooth shopping, including home-side software for shoppers, a Bluetooth key chain that stores and announces the shopper's preferences, and store-side software that serves product data and specials to the shopper. Ten finalists, out of 75 entrants, were invited to Washington. By reaching the 2001 finals, Boston University will automatically be invited to compete again next year.

Above: ECE Senior Design Team iShop with IEEE Computer Society President Benjamin Wah, CSIDC Chair Alan Clements, and Prof. Michael Ruane (from left to right)

Olufemi Dosunmu, Ph.D. student, was awarded the 2001 Department of Defense Fellowship. Dosunmu, an advisee of **Selim Ünlü**, also received Honorable Mention at the 2001 Boston University Graduate Science Day.

Matthew Emsley, Ph.D. student, was awarded the H. J. Berman "Future of Light" Prize in Photonics on Science Day 2001 for his development of new technology that may reduce the cost of photoreceivers in optical networking. Emsley, an advisee of **Selim Ünlü**, also received the Photonics Technology Award, presented at the 2001 Boston University Graduate Science Day, for his presentation entitled: *Silicon Resonant Cavity Enhanced Photodetectors Using Reflecting Silicon on Insulator Substrates.*
http://www.bu.edu/research/ScienceDay.html

E. Fred Schubert was named Fellow of the Optical Society of America, for contributions to light-emitting diodes, in particular for the invention and demonstration of the resonant-cavity LED and the photon-recycling semiconductor LED.
http://www.osa.org/aboutosa/awards/fellows/2001f.htm
He also received the Provost Innovation Award.

Kimani Toussaint, Ph.D. student, was awarded the Gates Millennium Fellowship. The Gates Millennium Fellowship was created with a grant from the Bill and Melinda Gates Foundation and is administered by the United Negro College Fund. Only 217 of the 4,000 Gates Scholarships (64,000 applicants) were awarded to graduate students. Toussaint's accomplishment will help to support his research work in the Photonics Center's Quantum Imaging Laboratory, directed by **Malvin Teich**, **Bahaa Saleh**, and **Alexander Sergienko**.

Rosalind Wynne, Ph.D. student, was selected as an Office of Naval Research/Historically Black College Committee Future Engineering Faculty Fellow. Wynne is an advisee of **Alexander Sergienko**.

Zhengrong Ying, Ph.D. student, was awarded the Dean's Award at the 2001 Boston University Science Day. Ying, an advisee of **David Castañon**, received the award for his poster entitled, *A Bayesian Framework for Occluded Nonrigid Object Recognition*.

Undergraduate Program

Enrollment in the BS program is at 409 students as compared to last year at 410 students. Enrollment in the Computer Systems Engineering (CSE) program now makes up roughly 62% of the total Undergraduate enrollment. Enrollment in the Electrical Engineering (EE) program has stabilized in the last three years after a period of decline in earlier years and is now increasing slightly.

Quality instruction continues to be of paramount importance to the ECE Department. The curriculum is continuously up dated to meet the needs of tomorrow's engineers. Mechanisms established to formalize this process include (See Section 3.1 for details) the EUCCLIDD Outcomes Criteria, Core Standards and Coordination, Core Review Committee, Industrial Advisory Committee, and the Graduation Survey. Efforts to enhance the undergraduate laboratories are successfully ongoing, and new equipment has been added this year to update several laboratories. 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 Project Conference Day, ECE Advising Day, and the ECE Teaching Excellence Award, continued this past year. (See Sections 3 and 4 for further information)

Graduate Program

Recruitment of graduate students remains a key challenge for the department. Domestic applications dipped from 45 last year to 37 this year. On the other hand, we had our best success ever (83%) in landing the top applicants through scholarship offers guaranteeing support throughout the students' stays in ECE. Enrollment in the MS program dropped 16% (from 80 to 67) this year to the lowest level in two decades. Driving the recent decrease has been the great job market for BS students, ECE's emphasis on research-oriented PhD students, and an increasing tendency for students to apply the the Post-BS PhD program (because we seek PhD students) with greater intent on stopping at the MS level. The number of PhD students increased 15% (from 72 to 83) to match its all-time high set in 1997. While we have experienced recent stabilization in this number, the fact that ECE had one PhD student 14 years ago attests to the great growth of the doctoral program since its relatively recent initiation. (See Section 4 for further information)

In Spring 2001 we initiated a plan to offer courses on a two-year cycle, with advanced graduate courses offered once every two years, required undergraduate courses offered every semester, and other courses offered at intermediate frequency based on past enrollment statistics. This new system will aid graduate-student course planning greatly and systematize faculty teaching expectations as well.

The ECE Deparmtnet has approved a new Masters program this year, the MS in Photonics, in recognition of the growing presence of photonics in the department and the demand for engineers trained in this discipline at a national level. The program must yet be approved at higher levels. (See Section 4 for additional information)

Research

New research funding this year totaled approximately $6.3M. The average annual research funding in the last six years (1996-01) is $5.1M, as compared to an average of $2.4M in the 1990-95 period. These figures include only grants and contracts for which the Principal Investigators (PI) were ECE faculty. The share of grants for which ECE faculty were Co-PI's totaled approximately $6.6k this year, bringing the total new funds to approximately $7M.

This year, the ECE faculty and graduate students published 80 archived journal articles, co-authored 7 book chapters, and made 105 conference contributions (papers, abstracts, and presentations). They also authored 10 patents or patent disclosures. (See Section 5 for a listing of faculty publications)

Workshops, Conferences, and Special Meetings

ECE Day 2001

The tradition of a project conference day for ECE Seniors, which was initiated in May 1997, continued this year. Held at the end of the Spring term, ECE Day 2001 included 23 presentations on different projects conducted by groups of 2 to 4 students. The conference was attended by departmental faculty and alumni. More information on ECE Day 2001 can be found in Section 3.

Teaching Workshop

Teaching workshops, offered formally as part of a new 2-credit course, SC850, are required for all ECE graduate students who are serving as teaching fellows for the first time. Besides being a valuable educational experience for these graduate students, this workshop also ensures that our undergraduates are served by better trained teaching fellows in their ECE courses. The workshop included panel and solo discussions, as well as play-acting scenarios on such topics as teaching methodology; presentation techniques; pedagogy; and an outline of teaching policies, procedures, and ethics. (See Section 3 for more details on Teaching Workshops)

ECE Advising Day

The ECE advising day is held each semester to enhance the advising system for ECE undergraduates. Held on the Friday before telephone/web registration begins for the next term, its involves pre-registration advising by faculty volunteers. This year in the spring it also included guided tours of various research and instructional laboratories, a presentation on the new senior design courses, and a panel discussion on Careers in Electrical and Computer Engineering.

ECE Retreat

The ECE Department held its annual Faculty Retreat at BU's Photonics Center, on May 4, 2001. This year the current state of the Department, including graduate and undergraduate trends, were reviewed. The faculty discussed the direction for faculty growth, alternative methods of faculty recruiting, and the findings from the Industrial Advisory Council's inaugural meeting.

Above: ECE Faculty at the retreat

New NSF Engineering Research Center

Center for Subsurface Imaging and Sensing (CenSSIS), a new National Science Foundation Engineering Research Center (ERC), was established in 2000. Founded by a $16.2M five-year grant, CenSSIS is a collaboration among four academic partners: Northeastern University, Boston University, Rensselaer Polytechnic Institute, and the University of Puerto Rico at Mayagüez. The Center is directed by Professor Michael Silevitch, of Northeastern, and **Professor Bahaa Saleh** serves as Deputy Director. For details see page 5-19 and http://www.bu.edu/news/releases/2000/9-28-CenSSIS.htm

Industrial Advisory Council

The ECE Department hosted its first meeting of the Industrial Advisory Council (IAC) on May 3, 2001. The IAC consists of 12 individuals from a variety of industries, who meet to provide guidance on the ECE curriculum, with particular focus on the skills that students should acquire prior to joining tomorrow's workforce. For this inaugural meeting, the IAC reviewed the history and structure of the Department, met with students and faculty to discuss the present and future outlook to meet the challenges of education, and attended a portion of the ECE Day presentations (See Section 3 for more information on ECE Day 2001). The IAC also toured a portion of the teaching and research facilities. (See below for attendees)

Above: Prof.'s Frederick Schubert, Hamid Nawab, Bahaa Saleh, and Allyn Hubbard with IAC members during dinner

Above: Prof. Bahaa Saleh, Prof. Frederick Schubert, and Rich Molnar at the IAC cocktail hour

Above: IAC Dinner

Industrial Advisory Council Members

Hassan Ahmed
President
Sonus Networks, Inc.

Jihad Boura
Chief Architect
Avian Communications

Julie M. Cubino
Manager, ASIC Design Kit
IBM Microelectronics

D. George Gata
Mixed Signal Custom
Products Department
Texas Instruments

Katie Hall
Founder, CTO, Director
PhotonEx

Micah Knapp
Staff Engineer
SGI

Christina Knopp
Marketing Manager
DUSA Pharmaceuticals Inc.

Kevin Knopp
VCSEL Development Manager
Nortel Networks

David Kukulinsky
Director of Software for Universal
Microsystem
Cradle Technologies

Ben H. Mbugua
Front Line Application Manager,
DSP Division
Analog Devices, Inc.,

Rich Molnar
Technical Staff
MIT Lincoln Laboratory

Gary Smith
Principal Engineer
Corning Lasertron, Inc.

2. Faculty and Staff

2.1 Faculty

Enrico Bellotti, *Assistant Professor*

- Ph.D., Georgia Institute of Technology, 1999
- Computational electronics; semiconductor materials and device simulations; power electronics; parallel computing

(See sidebar on page 1-1)

Irving Bigio, *Professor*

- Ph.D., University of Michigan, 1974
- Medical application of optics, lasers, and spectroscopy; biophotonics; applied spectroscopy; nonlinear optics, quantum electronics, and laser physics
- Fellow - Optical Society of America and American Society for Lasers in Medicine and Surgery

(See sidebar on page 1-2)

John Brackett, *Professor Emertius*

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

Richard Brower, *Professor*

- Ph.D., University of California-Berkeley, 1969
- Lattice gauge theory; molecular dynamics simulations

David Campbell, *Professor, Dean, College of Engineering*

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

(See sidebar on page 1-3)

Jeffrey Carruthers, *Assistant Professor*

- Ph.D., University of California, Berkeley, 1997
- Wireless infrared communications; broadband communications; mobile and wireless networks
- NSF CAREER Award
- 2000/01 ECE Faculty Award for Excellence in Teaching

(See sidebar on page 3-3)

Christos Cassandras, *Professor (primary appointment with the Department of 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
- Editor-in-Chief, *IEEE Transactions on Autonomic Control*; Member, IEEE Control Systems Society Board of Governors
- Fellow, IEEE
- 1991 Lilly Fellow

David Castañon, *Professor*

- Ph.D., Massachusetts Institute of Technology, 1976
- Stochastic control; estimation optimization; image understanding and parallel computation
- Associate Editor, *Computational Optimization and Applications*; Associate Director, Center for Subsurface Sensing and Imaging Systems

Charles Eddy, *Assistant Professor*

- Ph.D., Johns Hopkins University, 1998
- Semiconductor device processing and process characterization; electronic and optoelectronic device fabrication and characterization; novel III-V, especially III-V nitride, devices
- Associate Editor, Internet Journal of Nitride Semiconductor Research Steering Committee; Member, New England Chapter, American Vacuum Society
- Naval Research Laboratory Alan Berman Research Publication Award, 1994

Solomon Eisenberg, *Associate Professor, Associate Dean for Undergraduate Programs (primary appointment with the Department of Biomedical Engineering)*

- Sc.D., Massachusetts Institute of Technology, 1983
- Electrically mediated phenomena in tissues and biopolymers
- 1990 Metcalf Award for Excellence in Teaching
- NSF Presidential Young Investigator (1987-1993)

Carol Espy-Wilson, *Associate Professor*

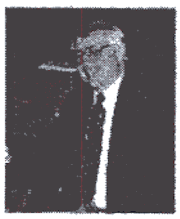
- Ph.D., Massachusetts Institute of Technology, 1987
- Speech processing, speech variability, acoustic and articulatory modeling and lexical access.
- Clare Boothe Luce Professor (1990-1995)
- NIH Independent Scientist Award

Azza Fahim, *Assistant Professor*

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

Leopold Felsen, *Professor (primary appointment with the Department of Aerospace and Mechanical Engineering)*

- D.E.E., Polytechnic Institute of Brooklyn, 1952
- Wave propagation and diffraction in various disciplines; high-frequency and time domain asymptotics; wave-oriented data-processing and imaging
- Member, National Academy of Engineering; Fellow – IEEE, Optical Society of America, Acoustical Society of America, John Simon Guggenheim Foundation, IBM (at Northeastern University)
- IEEE Medals: Heinrich Hertz Gold Medal, 1991; Centennial, 1984; 3rd Millenium, 2000
- Humboldt Foundation, Senior Scientist Award, 1980
- Honorary Doctorate, Technical University of Denmark, 1979
- URSI Balthasar Van der Pol Gold Medal, 1975



Theodore Fritz, *Professor (primary appointment with the Department of Astronomy and the Center for Space Physics)*

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

Roscoe Giles, *Professor*

- Ph.D., Stanford University, 1975
- Advanced computer architectures; distributed and parallel computing; computational science
- NSF Partnerships for Advanced Computational Infrastructure (PACI): Co-Chair, National Educational Outreach and Training Coordinating Committee; Co-Chair, Alliance Collaborative and Data Storage Team
- 1996 College of Engineering Award for Excellence in Teaching

Bennett Goldberg, *Professor (primary appointment with the Department of 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

Mark Horenstein, *Professor; Associate Dean for Graduate Programs*

- Ph.D., Massachusetts Institute of Technology, 1978
- Applied electromagnetics; electrostatics, micro-electromechanical systems (MEMS)
- President Electrostatics Society of America
- Registered Professional Engineer

Allyn Hubbard, *Professor*

- Ph.D., University of Wisconsin-Madison, 1977
- VLSI circuit design; digital, analog, subthresh old analog, biCMOS, CMOS; information processing in neurons, neural net chips, synthetic aperture radar (SAR) processing chips, sonar processing chips; auditory models and experiments

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; Magnetics Society 1988 Achievement Award; Millenium Medal

W. Clem Karl, *Associate 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
- Associate Editor, *IEEE Transactions on Image Processing*
- 1999/00 ECE Faculty Award for Excellence in Teaching

Mark Karpovsky, *Professor*

- Ph.D., Leningrad Electrotechnical Institute, 1967
- Testing and diagnosis of computer hardware; fault-tolerant computing; error correcting codes
- Fellow, IEEE

Thomas Kincaid, *Professor*

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

Ronald Knepper, *Professor*

- Ph.D., Carnegie Mellon University, 1969
- VLSI integrated circuit technology; silicon CMOS & bipolar devices; numerical device simulation; SiGe BICMOS device and circuit modeling
- Fellow, IEEE

Janusz Konrad, *Associate Professor*

- Ph.D., McGill University, 1989
- Multimedia communications; image and video processing; stereoscopic and 3-D imaging; digital signal processing
- Associate Editor, *IEEE Trans. on Image Processing*, 1996-2000; Associate Technical Editor, *IEEE Communications Magazine*

Technical Prog. Co-chair; International Conference on Image Process ing, ICIP-2000; Member, Image and Multidimensional Digital Signal Processing Committee of the IEEE Signal Processing Society
(See sidebar on page 1-2)

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
- Member, Electromagnetics Academy

Valery Kozlov, *Research Assistant Professor*

- Ph.D., General Physics Institute of the Russian Academy of Science, 1987
- Fiber Optics and Laser Physics

Min-Chang Lee, *Professor*

- Ph.D., University of California, San Diego, 1977
- Radio communications; experimental plasma physics; ionospheric plasma physics

Lev Levitin, *Distinguished Professor*

- Ph.D., USSR Academy of Sciences, Gorky University, 1969
- Information theory; physics of communication and computing; quantum theory of measurements; complex and organized systems; reliable computing
- Fellow, IEEE; Member, New York Academy of Sciences governing body of Dielectric Division of the Electrochemical Society; Member, Electronic Materials Committee
- 1997/98 ECE Faculty Award for Excellence in Teaching

Thomas Little, *Associate Professor*

- Ph.D., Syracuse University, 1991
- Multimedia computing, computer networking, software engineering
- Editorial Board Member, *IEEE Multimedia, Multimedia Systems*
- Member, Executive Committee for the IEEE Computer Society Technical Committee on Multimedia Computing

Fei Luo, *Research Associate Professor*

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

Michael Mendillo, *Professor (primary appointment with the Department of Astronomy and the Center for Space Physics)*

- Ph.D., Boston University, 1971
- Signal processing in Space Physics; Low-light-level CCD instrumentation; atmospheric emission tomography; GPS satellite communi cations; space plasmas in the solar system
- Fellow, American Geophysical Union

Theodore Morse, *Professor*

- Ph.D., Northwestern Univeristy, 1961
- Photonic material processing; optical fiber fabrication, lasers, and sensors
- Fulbright Fellow, Germany

Theodore Moustakas, *Professor*

- Ph.D., Columbia University, 1974
  III-Nitrides, growth by molecular beam epitaxy, vapor phase epitaxy and ion-beam cluster deposition methods; study of semiconductor properties and devices (blue-UV VCSELs, optical modulators, detectors, transistors and MEMS)
- Fellow - American Physical Society and Electrochemical Society; Member - Advisory Board, North American MBE; Governing Body, Dielectric Science and Technology Division of the Electrochemical Society
- 1997/98 ECE Faculty Award for Excellence in Teaching

S. Hamid Nawab, *Associate Professor, Associate Chairman for Undergraduate Studies*

- Ph.D., Massachusetts Institute of Technology, 1982
- Digital signal processing, real-time, low-power, and distributed signal processing; image processing; communication and biomedical applications; integrated DSP environments and architectures, knowledge-based signal processing, and applications in auditory scene interpretation, music and EMG signal analysis.
- 1988 Best Paper Award, *IEEE Signal Processing Society*
- 1993 Metcalf Award for Excellence in Teaching
- 1998 College of Engineering Award for Excellence in Teaching

Truong Nguyen, *Professor*

- Ph.D., California Institute of Technology, 1989
- Digital image processing; wavelets; filter banks and applications; image and video compression
- Associate Editor, *IEEE Transactions on Signal Processing*; Associate Editor, *IEEE Transactions on Circuits and Systems II*
- 1992 Best Paper Award, *IEEE Signal Processing Society*
- 1999 Boston University Technology Award

William Oliver, *Associate Professor, Associate Chairman for Graduate Studies*

- Ph.D., University of Illinois, 1973
- Radar studies of the upper atmosphere and ionosphere; geophysical modeling and simulation; global change in the upper atmosphere

David Perreault, *Professor*

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

Tatyana Roziner, *Associate Professor*

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

Michael Ruane, *Associate Professor*

- Ph.D., Massachusetts Institute of Technology, 1980
- Magneto-optical materials; optical data storage; optical systems; communications
- 1998/99 ECE Faculty Award for Excellence in Teaching

Bahaa E.A. Saleh, *Professor and Chair*

- Ph.D., Johns Hopkins University, 1971
- Quantum optics; statistical optics; optical processing; image Processing; liquid crystal displays
- Fellow – IEEE, Optical Society of America, and John Simon Guggenheim Foundation
- Editor in Chief, *Journal of the Optical Society of America A* (1991-1997); Chairman, Board of Editors, *Optical Society of America* (1999)
- Optical Society of America Beller Award (1999)

E. Fred Schubert, *Professor*

- Ph.D., University of Stuttgart, 1986
- Technology and physics of lasers and light-emitting diodes; semiconductor devices research
- Fellow, IEEE, SPIE, 1999
- Literature Prize of the German Engineering Society, 1993
- Alexander von Humboldt Senior Research Award, 1999
- RD100 Award, 2000
- Discover Magazine Award for Technological Innovation, 2000

Eric Schwartz, *Professor (primary appointment with Department of Cognitive and Neural Systems)*

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

Alexander Sergienko, *Associate Professor*

- Ph.D., Moscow State University, 1987
- Quantum optics, including quantum radiometry and metrology; laser physics; nonlinear optics; quantum communications; remote laser sensing; correlation spectroscopy, field optical microscopy and spectroscopy of semiconductor materials and devices
- NSF CAREER Award

2001 College of Engineering Award for Excellence in Teaching

Thomas Skinner, *Associate Professor*

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

William Skocpol, *Professor (primary appointment with Department of Physics)*

- Ph.D., Harvard University, 1974
- Nanofabrication; device processing; transport experiments in materials
- Fellow, American Physical Society

Johannes Smits, *Associate Professor*

- Ph.D., Twente University of Technology, the Netherlands, 1978
- Integrated sensors and actuators; piezo electric thin films; silicon bulk machining; MEMS devices; optical scanners; micropumps; DNA sequencing tools
- Fellow, IEEE; Elected Member, ADCOM, IEEE Ultrasonics, Ferroelectics and Frequency Control Society; Chair, IEEE Standards Committee on Actuators and Transducers; Associate Editor, *IEEE Transactions Ultrasonics, Ferroelectics and Frequency*

David Starobinski, *Assistant Professor*

- Ph.D., Technion, Israel Institute of Technology, 1999
- High-speed communication networks; wireless cellular networks

(See sidebar on page 1-2)

Neeraj Suri, *Associate Professor*

- Ph.D., University of Massachusetts at Amherst, 1992
- Distributed, dependable, real-time systems; distributed algorithms and architectures
- NSF CAREER Award

Anna Swan, *Research Assistant Professor*

- Ph.D., Boston University, 1993
- High resolution thermal imaging of semiconductor using inelastic light scattering

Malvin C. Teich, *Professor*
- Ph.D., Cornell University, 1966
- Quantum optics and imaging; photonics; fractal stochastic processes; information transmission in biological sensory systems
- Fellow – IEEE, Optical Society of America, American Physical Society, Acoustical Society of America, American Association for the Advance ment of Science, and John Simon Guggenheim Foundation
- IEEE Browder J. Thompson Memorial Prize
- IEEE Morris E. Leeds Award
- Palacky University Memorial Gold Medal

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
- Editorial Board Member, *Complex Systems; The Interjournal*

(See sidebar on page 1-3)

Ari Trachtenberg, *Assistant Professor*
- Ph.D., University of Illinois, Urbana-Champaign, 2000
- Error correcting codes, cryptography; algorithms, approximations, computation, visualization

(See sidebar on page 1-2)

Selim Ünlü, *Associate Professor*
- Ph.D., University of Illinois, Urbana-Champaign, 1992
- Design, processing, characterization and simulation of semiconductor optoelectronic devices; near-field optical microscopy and spectroscopy of semiconductor materials and devices
- NSF CAREER Award, Lightwave Technology Program
- ONR Young Investigator Award

Richard Vidale, *Professor*
- Ph.D., University of Wisconsin-Madison, 1964
- Modeling and simulation, software engineering

Moe Wasserman, *Professor Emeritus*
- Ph.D., University of Michigan, 1955
- Semiconductor processing, electronic circuits

IEEE Fellows

Christos Cassandras
Leopold Felsen
Floyd Humphrey
Mark Karpovsky
Ronald Knepper
Lev Levitin
Bahaa E.A. Saleh
E. Fred Schubert
Johannes Smits
Malvin C. Teich

NSF PYI/CAREER Awards

Jeffrey Carruthers
Thomas Little
Truong Nguyen
Alexander Sergienko
Neeraj Suri
Selim Ünlü

2.2 Adjunct Faculty

The ECE Department looks outside the 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. Below is a list of people who have helped the Department meet its teaching needs over the past year.

Jihad Boura, *SC312 Small Computer Systems*
(Fall 2000, Spring 2001)
- Ph.D., Boston University, 1998

Vladimir Kleptsyn, *EK130 Introduction to Engineering*
(Fall 2000)
- Ph.D., Moscow Lomonosov's Institute of Fine Chemical Technology, 1983
- Distributed Semiconductor Processing Lab Engineer

Alan Pisano, *SC402 Control Systems*
(Spring 2001)
- Ph.D., Northeastern University, 1974

James Sullivan, *EK130 Introduction to Engineering*
(Spring 2001)
- Ph.D., University of Chicago, 1970

2.3 Scientists

Name	Title	Sponsor
Boyce, Suzanne	Research Affiliate	**Carol Espy-Wilson**
Carlson, Erica	Research Associate	**David Campbell**
Chari, Vankatesh*	Visiting Scientist	**Carol Espy-Wilson**
Cohen, Howard	Clinical Instructor	**Allyn Hubbard**
D'Andrea, Vincenzo*	Visiting Scholar	**Tomasso Toffoli**
Daniell, Matthew	Research Associate	**Alexander Sergienko**
Daulier, Eric*	Research Assistant	**Alexander Sergienko**
Di Giuseppe, Giovanni	Research Associate	**Alexander Sergienko**
Emre, Erol*	Research Associate	**David Castañon**
Galdi, Vincenzo	Research Associate	**David Castañon**
Goano, Michele	Visiting Scholar	**Enrico Bellotti**
Hendrych, Martin	Visiting Scholar	**Malvin Teich**
Hernandez-Cordero, Juan*	Research Associate	**Thedore Morse**
Kakay, Attila	Visiting Scholar	**Floyd Humphrey**
Kawahara, Tadisha	Visiting Scholar	**Theodore Morse**
Lehrmann, Brian*	Research Assistant	**Theodore Morse**
O'Neil, Jeffrey*	Research Associate	**Clem Karl**
Polyakov, Alexander*	Research Associate	**Frederick Schubert**
Redjdal, Makhlouf	Research Associate	**Floyd Humphrey**
Sandler, Nancy	Visiting Scholar	**David Campbell**
Sans, Laurent*	Visiting Scholar	**Alexander Sergienko**
Shubochkin, Roman	Research Assistant	**Theodore Morse**
Sugimoto, Toshiyuki*	Visiting Scholar	**Mark Horenstein**
Taibi, Guiseppi*	Visiting Scholar	**Hamid Nawab**
Wylangowski, George	Senior Research Associate	**Theodore Morse**

*Completed Appointment during 2000/2001

2.4 Technical Staff

Yuri Fedyunin	*Wide Band Gap Semiconductors Laboratory Manager*
Aaron Caine	*VLSI Laboratory Manager*
Yefim Levin	*Microprocessor Laboratory Manager*
Raul Rodriguez	*Electronics Laboratory Manager*
Vladimir Kleptsyn	*Distributed Semiconductor Processing Lab Engineer*

2.5 Administrative Staff

Erik Kachmarsky	*Administrative Assistant*
Joy Field	*Academic Programs Administrator*
Wayne Rennie	*Department Director*
James Bransford*	*Grants Administrator*
Jae Kim**	*Grants Administrator*
Adam DiNicola*	*Financial Administrator*
Joe Barbieri	*Financial Administrator*
OPEN	*Senior Administrative Secretary*

* Resigned during 2000/2001

** Served as Senior Administrative Secretary and was promoted during 2000/2001

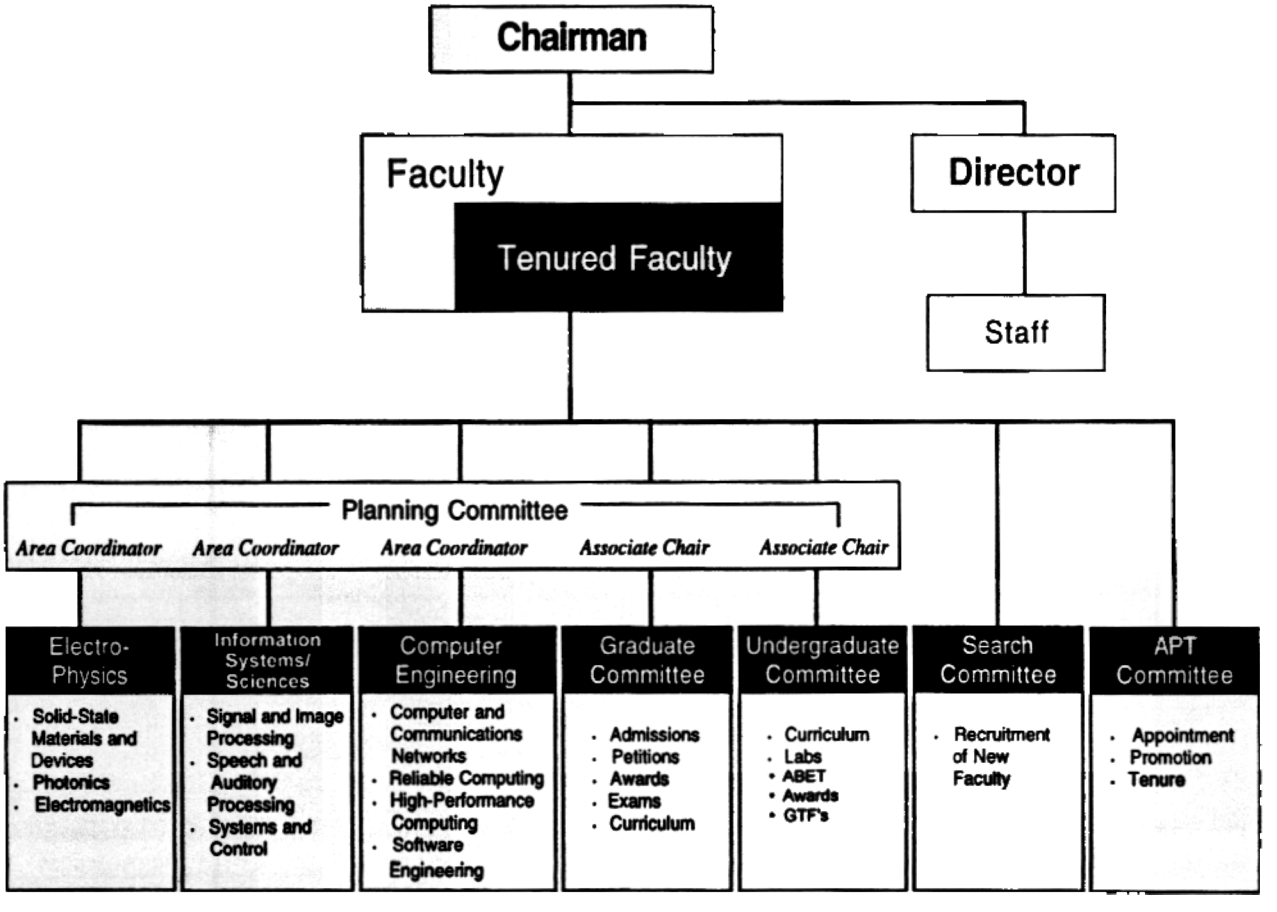
2.6 Department Administration & Committees

Bahaa Saleh	*Department Chair*
Hamid Nawab	*Associate Chair for Undergraduate Studies*
William Oliver	*Associate Chair for Graduate Studies*

Faculty committees direct the academic operations and planning for the ECE Department. The Undergraduate and Graduate Committees are responsible for curricular and studentaffairs. The Planning Committee comprises the coordinators of the three areas of research and instruction (electro-physics, information systems & sciences, and computer engineering), the Chairman, Director, and the two Associate Chairs, and is responsible for strategic initiatives.

Planning Committee	Graduate Committee	Undergraduate Committee	Search Committee	APT Committee
Saleh (Chair)	**Oliver (Chair)**	**Nawab (Chair)**	**Saleh (Chair)**	**Saleh (Chair)**
Oliver (Assoc. Chair)	Bellotti	Eddy	Carruthers	Brower
Nawab (Assoc. Chair)	Konrad	Fahim	Castañon	Espy-Wilson
Vidale (Comp. Eng.)	Levitin	Horenstein	Giles	Hubbard
Karl (Signals)	Sergienko	Kincaid	Karpovsky	Levitin
Ruane (Electro-Phys.)	Trachtenberg	Knepper	Lee	Moustakas
Rennie (ex-officio)		Roziner	Ünlü	Nguyen
		Starobinski	Vidale	Teich
			Rennie (ex-officio)	Rennie (ex-officio)

2.7 Organizational Chart



2.8 ECE Representation in the College of Engineering and University

College of Engineering Committee	Faculty
APT Committee	Castañon, Karpovsky, Moustakas
Graduate Committee	Horenstein (Chair), Oliver
Scholarship Exam Committee	Horenstein (Chair), Ünlü
Undergraduate Committee	Nawab
Student Conduct Committee	Kincaid
Professional Practice Advisory Group	Knepper

University Committee	Faculty
APT	Ruane
Committee on Research Activities and Libraries	Ünlü
Faculty Council	Giles, Ünlü
Patent Policy Committee	Moustakas
Undergraduate Research Opportunity Program	Ünlü

Advisory Group	Faculty
IEEE	Nguyen
Minority Engineers' Society (MES)	Giles
Student Association of Graduate Engineers (SAGE)	Ruane
Society of Hispanic Professional Engineers (SHPE)	Castañon
Society of Women Engineers (SWE)	Fahim
Tau Beta Pi	Nawab
Engineering House	Nawab

3. Undergraduate Programs

3.1 Highlights

Academic Programs

The undergraduate programs in Electrical Engineering (EE) and Computer Systems Engineering (CSE) serve our departmental mission, which aims to:

Educate our students to meet high standards of excellence in electrical and computer engineering in preparation for professional careers and advanced studies.

Create and disseminate knowledge through basic and applied research in electrical and computer engineering.

Serve as a resource of electrical and computer engineering expertise at the local, regional, and national levels.

The design of each program is motivated by the objective of producing graduates who have the following attributes:

1) A strong foundation in EE/CSE with an appropriate balance between theory and application.

2) A wide repertoire of techniques and skills for the effective practice of modern EE/CSE.

3) An integrated view of the subfields of EE/CSE.

4) A broad education and ethical awareness to serve as responsible professionals.

5) An ability to expand their knowledge to adapt to changes in technology.

In order to achieve these objectives, we have designed a systematic outcomes-based framework for the assessment of outcomes and the adaptive adjustment of the means of delivery of our undergraduate programs. Within the context of this framework, we have divided the desired outcomes for the graduates of our programs into seven categories:

Educational Breadth (E)
- --Awareness of interrelationships of technology, society and ethics.
- --Sense of professional and ethical responsibility.
- --Knowledge of contemporary issues.
- --Appreciation for the humanities.
- --Ability to communicate in broad social contexts.

Understanding (U)
- --Knowledge of scientific laws and their mathematical underpinnings.
- --Knowledge of principles of current technology.
- --Ability to identify, formulate, and solve diverse EE/CSE problems.

Communication (C)
- --Ability to organize, critique and convey complex technical information.
- --Ability to communicate in broad social contexts.

Collaboration (C)
- --Ability to function as valuable members of multidisciplinary teams.
- --Experience in collaborative learning.

Laboratory (L)
- --Ability to conduct experiments and analyze and interpret data.
- --Ability to utilize state-of-the-art hardware and software tools.

Integrated View (I)
- --A broad knowledge of EE/CSE sub fields.
- --Knowledge of interrelationships between sub fields.
- --Ability to integrate concepts from different sub fields.

Design (D)
- --Ability to design and implement systems, components and processes to meet desired needs.
- --Practical experience in design.
- --Ability to utilize design tools.

Discovery (D)
- --Ability to conduct discovery in technical areas.
- --Awareness of the importance of life-long learning.
- --Knowledge and experience with resources for life-long learning.
- --Experience in collaborative learning.

In order to demonstrate/assess the achievement of these seven categories of "EUCCLIDD" outcomes, we have so far instituted the following processes:

A) Core Standards and Coordination
B) Core Review Committee
C) ECE Industrial Advisory Committee
D) Graduation Survey

Core Standards and Coordination

Upon the recommendation of the ECE Undergraduate committee, the department has instituted a process of setting and maintaining outcome standards for "core" courses in the EE and CSE programs. The core courses for each program are a subset of the "common experience" for all graduates of that program. The respective cores for the two programs are as follows:

EE Core:
- Entry Gateway: EK307 (Circuit Theory)
- Distribution: SC311 (Logic Design), SC401 (Signals & Systems), SC410 (Electronics), SC455 (Electromagnetic Systems I).
- Capstone Gateway: Senior Project (Currently: SC466, Starting Fall 2001: SC463 & SC464)

CSE Core:
- Entry Gateway: EK307 (Circuit Theory)
- Distribution: SC311 (Logic Design), SC401 (Signals & Systems), SC410 (Electronics), SC312(Computer Organization), SC330 (Algorithms).
- Capstone Gateway: Senior Project (Currently: SC466, Starting Fall 2001: SC463 & SC464)

The department also approved the ECE Undergraduate Committee's recommendation to appoint a Course Coordinator for each core course. The Course Coordinator is responsible for coordinating the offerings of the course in different semesters in order to ensure that the appropriate EUCCLIDD outcomes are being achieved. The Course Coordinator is also the main liaison for the course to the Core Review Committee. In this capacity, the Course Coordinator is responsible for ensuring that appropriate documentation of the course outcomes is carried out by the course staff.

Core Review Committee (CRC)

This committee is charged with monitoring the achievement of EUCCLID outcomes within the program cores. The committee consists of two faculty, two current ECE students, and two ECE alumni and it is typically expected to examine in detail two core courses per semester. Since committee membership is expected to change from semester to semester, the Associate Chair for Undergraduate studies is a non-voting member responsible for coordinating its activities and providing its "institutional memory." Spring 2001 was the first semester of activity for this committee when it reviewed the Entry Gateway EK307, and the Capstone Gateway SC466. The Committee membership for Spring 2001 is listed below:

Prof. Charles Eddy	Izzat Abou-Amarah (ECE Alumnus)
Prof. Thomas Kincaid	Peter McNerney (ECE Alumnus)
Marna Eckels (ECE Jr.)	Mark Lande (ECE Sr.)
Prof. S. Hamid Nawab (Non-Voting)	

The Course Coordinators during the review process were Prof. Azza Fahim (EK307) and Prof. Ron Knepper (SC466). The Spring 2001 CRC submitted its reports on EK307 and SC466 to the ECE Undergraduate Committee in May 2001, which in turn will use the reports as the basis for recommending future changes in the core.

Industrial Advisory Committee (IAC)

Spring 2001 also marked the first meeting of the Industrial Advisory Committee of the ECE Department. The meeting was held on May 3, during ECE Senior Project Day. The morning session consisted of the committee being given an overview of the department, its undergraduate programs, and its capstone design project courses. The committee also visited various undergraduate instructional laboratories and attended several senior design project presentations. In the afternoon session, the committee met with a group of about 20 ECE undergraduates to assess their opinions and concerns about the ECE undergraduate programs. Finally, they met with ECE faculty to share their impressions about the undergraduate programs in the department. They lauded the laboratory facilities of the department, the changeover to a 2-semester design project sequence, and the availability of several upper division electives in the EE curriculum. However, the expressed concern over the availability of only one technical elective in the CSE program and encouraged the department to explore possible remedies. They were also in favor of eliminating the PY313 (Modern Physics) requirement for the CSE program but they did not reach any consensus on whether or not PY313 should be required for EE majors.

Graduation Survey

During ECE Senior Project Day on May 3, 2001, the graduating seniors were asked to complete a graduation survey based upon the EUCCLIDD outcomes. The response rate was over 90%.

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 six 1-hour workshops were held each semester. These workshops included panel and solo discussions and play-acting scenarios on teaching methodology, presentation techniques, pedagogy, ethics etc.

ECE Advising Day

Continuing a tradition initiated in 1998, each semester an ECE Advising Day is held just prior to the commencement of the telephone registration period for the next term. On these days many ECE professors volunteered up to four hours of pre-registration advising time for their students. In the

spring semester, ECE Advising Day also included guided tours of various instructional and research laboratories. These tours, co-sponsored by the IEEE chapter at Boston University, attracted about 30 ECE undergraduates and about 60 Boston-area high school students. This day also included a 30-minute presentation by Prof. Michael Ruane on the new senior design project courses, and a 1-hour panel discussion on Careers in Electrical and Computer Engineering. The panel members were Prof. Charles Eddy, Prof. Ronald Knepper, Mr. Peter McNerney (alumnus), and Ms. Erica Sarli (alumna), and Prof. Tom Kincaid (Moderator).

ECE Teaching Award

During the 1997-98 academic year, the ECE Department instituted an award 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 $1000 prize to be used towards instructional activities. A committee of ECE professors and students evaluated the nominees. They looked at teaching statements and classroom material, sat in on classes, and collected comments from students. The 2000-2001 winner was Prof. Jeffrey Carruthers (See sidebar).

ECE Project Conference Day 2001

The ECE Project Conference Day, an annual feature at the end of the spring term, once again was successful in showcasing the work of our seniors and graduate students to other students, faculty, alumni, and company representatives. Senior Project presentations were held in two parallel sessions from 9am to 1pm.

Professors Michael Ruane and Ronald Knepper, the two Senior Project instructors for Spring 2001, chaired the two sessions (See Section 3.7). An awards luncheon was held to recognize outstanding project presentations and to announce the ECE Faculty (See sidebar) and GTF Teaching Awards (See page 1-3).

P.T. Hsu Award

The P.T. Hsu Award is given annually to the best senior design project in the ECE Department. A faculty committee reviews each team's project, including written materials and presentations. For this year's winners, see page 3-8.

Professor Jeffrey B. Carruthers is the winner of the 2001 ECE Award for Excellence and Innovation in Teaching. The award was recommended by the 2001 ECE Teaching Award Committee, chaired by Associate Chair S. Hamid Nawab. The committee includes past winners of the award, Professors Michael Ruane and Clem Karl, a graduate student, and anundergraduate student. The committee recognized Professor Carruthers' teaching accomplishments in regards to:

1. His leadership in development of a first class laboratory facility for students in signals, systems, and network courses.
2. His use of "active" learning. During lectures his students use computers to analyze, model, and simulate the communication systems and networks being discussed.
3. His effective use of electronic and computer media in classroom presentations.
4. His excellent teaching evaluations. A former student captures the theme that runs throughout the evaluations when he says about Prof. Carruthers: "Excellent Professor. Very interactive. Very good at explaining the fundamental concepts and putting them in perspective."

Enrollment

Fall 2000

	Electrical	Comp. Sys.	TOTAL
Freshmen*	24	63	**87**
Sophomores*	25	51	76
Juniors	42	69	111
Seniors	66	69	135
TOTAL	**157**	**252**	**409**

Spring 2001

	Electrical	Comp. Sys.	TOTAL
Freshmen*	23	62	85
Sophomores*	33	53	86
Juniors	46	71	117
Seniors	52	56	108
TOTAL	**154**	**242**	**396**

*Note: ENG students are not required to declare their major until their Junior year

Degrees Awarded

Degrees Awarded

Electrical Engineering	51
Computer Systems Engineering	38
TOTAL	**89**

Honors Students

Summa Cum Laude	9
Magna Cum Laude	7
Cum Laude	19
TOTAL	**35**

3.4 Instructional Labs

Circuits and Electronics Laboratory

The Circuits and Electronics lab includes a full line of Hewlett-Packard bench top instruments linked by HP-VEE software. This continually updated facility, which supports ECE courses in circuits and electronics, enables us to offer traditional lab experiments in circuits in electronics in a modern laboratory setting the emulates those found in industry. The lab also can support more advanced experiments in signals and systems, communications, electromagnetics, and photonics. *Nawab*

Control Systems Laboratory

This laboratory houses four ECP Model 220 Industrial Emulator/Serve Trainers for studying control of practical systems. *Vidale*

Distributed Semiconductor Processing Laboratory

This laboratory contains equipment for the fabrication of silicon integrated circuits. Facilities include wet etching and cleaning stations, diffusion/oxidation furnaces, a mask aligner, film deposition systems, and wafer probing and characterization stations. The core equipment in this laboratory was donated through the Massachusetts Microelectronics Center. *Bellotti, Moustakas, Schubert*

High Performance Computing Laboratory

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

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. For networking studies, the laboratory contains four PC systems connected in a local loop with access to a larger local loop in the nearby microprocessor lab and to the campus area network. Networking software, various simulators, and analysis packages are available. *Perreault*

Network Computing Laboratory

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

Networks Laboratory

This laboratory provides facilities for experiments involving data communication links, local-area networks, and wide-area networks. 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. *Carruthers*

Photonics Laboratory

The Photonics Laboratory serves the introductory and intermediate photonics courses—Introduction to Photonics, SC560; Fiber Optic Communication Systems, SC563; and Lasers, SC570. The lab is equipped with lasers, vibration-isolated optical tables, optical fiber components and systems, and facilities for experiments in diffraction, interferometry, holography, and acousto- and electro-optic modulation and scanning. *Ruane, Teich, Ünlü*

Radio Communication Laboratory

The Radio Communication Laboratory supports lab experiments for courses in electrodynamics, waves and antennas, and wireless communication. Equipment includes a transmission line training station, benchtop receiving/transmitting antenna, radio receivers covering the radio spectrum from 1.6 MHz to 440 MHz, and two radio transmitters. Several antennas, including a four element rotating beam, a long-wave trap dipole, and a two-meter vertically polarized directional antenna, are located on the roof of the photonics building. The Radio Communication Laboratory also serves as the home of the ECE-sponsored Boston University Amateur Radio Club. *Horenstein*

Senior Project Laboratory

This lab is operated as a virtual company, serving real-world customers such as NASA, Analog Devices, Boston and Brookline Public Schools, social service agencies, and faculty and staff across 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 cross-compilers for DSP and micro-controller development. *Ruane, Knepper, Horenstein*

Signals Laboratory

This laboratory houses numerous workstations for digital signal processing, image processing, and various real-time applications covering the complete audio frequency spectrum. Equipment includes PC's, 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), SC416 (Intro to Digital Signal Processing), SC 512 (Digital Signal Processing), and some ECE modules in EK130 (Introduction to Engineering). *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, computer-based systems. The lab includes a group of Silicon Graphics and Gateway 2000 networked workstations and provide students with state-of-the-art development tools for the design, implementation, and testing of software systems. *Vidale*

VLSI/CAD Laboratory

In this lab, students design circuits using state-of-the-art computer automated design systems. Facilities include four HP B180L workstations, eight DEC Micro VAXs, seven DECstation 3100's, two DECstation 5000's, six DEC Alphas, and four HPs, plus chip-testing electronics, and associated display and software systems. Software tools include ViewLogic, Synopsis, Mentor Graphics, and Cadence. *Hubbard, Knepper*

Expenditures for Instructional Laboratories 2000/01

FACILITY	EQUIPMENT	APPROXIMATE COST
Electronics Lab	Workstations, Lab kits, Electric kits, etc.	$ 32,984
Semiconductor Lab	Wafers, Mask aligner repair	$ 4,473
Senior Project Lab	Laser printer, Workstations, Software licenses, Protoboards	$ 93,503
Signals/Networks Lab	Workstations with cameras, Software	$ 66,952
Microprocessing Lab	Workstations, Ethernet switches, etc.	$ 28,620
Software Design Lab	Workstations and installation	$ 20,369
VLSI Lab	Server, Workstation, Printer, Installation	$ 58,668
TOTAL		**$ 305,569**

3.5 Undergraduate Courses

Course	Course Title	Fall 2000	Spring 2001	Summer 2001
EK100	Freshmen Seminar	Faculty		
EK130	Intro. to Engineering	Kincaid	Kincaid	
		Kleptsyn	Sullivan	
		Horenstein		
EK307	Electric Circuit Theory	Fahim	Roziner	**Lee**
			Kotiuga	
			Kincaid	
EK 317*	Electric Circuit Theory I	Oliver		
EK 318*	Electric Circuit Theory II		Oliver	
EK420	Intro. Parallel Computing	Giles		
EK501	Math Methods I	Kotiuga		
SC311	Intro. to Logic Design	Roziner	Kincaid	**Roziner**
SC312	Computer Organization	Boura	Boura	
SC330	Applied Algorithms/Data Structures	Brower	Brower	
SC401	Signals & Systems	Kincaid	Nawab	
SC402	Control Systems		Pisano	
SC410	Intro. To Electronics	Eddy	Lee	**Lee**
		Sergienko	Bellotti	
		Ünlü		
SC412	Analog Electronics		Sergienko	
SC415	Communication Systems	Carruthers	Roziner	
SC416	Intro. to Digital Signal Processing	Nguyen	Konrad	
SC440	Intro. to Operating Systems	Skinner	Skinner	**Skinner**
SC447	Software Design	Skinner	Skinner	**Skinner**
SC450	Microprocessors	Toffoli	Toffoli	
SC455	Electromagnetic Systems I	Saleh	Lee	
		Lee	Kotiuga	
		Kotiuga		
SC466	Senior Design Project	Knepper	Knepper	
		Ruane	Ruane	
SC467	Senior Honors Thesis		Sergienko	
SC471	Physics of Semiconductor Devices	Moustakas	Schubert	

***MET courses taught by ECE professors to support the MET SEP program.**

3.6 Freshman Research Opportunity Program (FROP)

Name	Professor
Michael Chalson	Horenstein
Joseph Farkas	Horenstein
Kendra Grant	Morse
Donna Khalife	Unlu
Vincent Lai	Teich
Haig Panossian	Morse
Lyndon Pham	Ruane
Geoffrey Rowland	Trachtenberg/Starobinski
Andrew Schwartz	Teich

3.7 Senior Design Projects

The Senior Project Laboratory, PHO113, supports the ECE Department's capstone senior project course, required of all ECE students. This course, introduced in 1990, provides seniors with practical skills and training in project management, product development, and engineering design. Teams work on projects for real-life clients, from NASA to local schools. Three teams partnered with AME design teams, and three other teams worked with SMG entrepreneurs. Teams of three or four students propose a product, electronic device, or software system, make presentations to their customer, write inter- and intra-office memos, design their project to customer specifications, manage the project budget, and deliver the working product, complete with a detailed instruction manual. Formal ECE Day presentations mark the end of the projects.

2001 P.T. Hsu Award

The best senior design project in the ECE Department is chosen by a faculty committee, based on the projects, written materials, and the team presentations. This year's winners were Team Super GT, working on the Global Positioning System Trip Manager. Team members included **Jason Ellow, Norman Eng, Connie Lee,** and **George Papadopoulos**. The GPS Trip Manager project was developed as a GPS appliance that could be used by campus visitors, tourists, or any applications following an itinerary of known sites. The team integrated a battery-powered microprocessor unit with an OEM GPS receiver and PC mapping software. The portable Trip Manager uses GPS to locate its position and announces nearby landmarks (previously set by the user). After the trip, a record of the travel path and sites visited can be uploaded to a PC and mapped, using a commercial digital map database. The system was tested extensively around the Charles River basin, using landmarks like the Harvard Bridge, BU Boathouse and Hatch Shell.

Notable 2000-2001 Senior Projects

Team Members	Project and Customer
Team Arm Chop Anurag Chhabra, Nathan Paradis, Mark Sika, Nicholas Zubrzycki	Folding garage door safety system TwinDoor Corp., Suzhou, P.R.C.
Team Evil Cow Charles Blazer, Kim DiPasquale, Megan Kirkman, Shen-HoeiYeoh	Audio tape verification system B.U. Medical School
Team Guinness Arthur Gunawan, Tevis Morrow, Ketan Patel, Lee Perrault	Beowulf cluster benchmarking ECE Department
Team Freq e Flow Mark Cukier, Michael Ducott,Amit Malik, Adam Miller	Wire spoooler controller AME Department (w/AME team)
Team Electric Slide Show Paul Benson, Brianna Boroway, Nelly Medrano, Elly Sirotta	Automatic infant crib rocker Sargent College
Team JPMW Jody Chai, Melanie Leung, PatsudaTonburintripye, Wingsze Yuen	Wine sales kiosk SMG Entrepreneur's Center

Above: *Team Evil Cow* - Shen-Hoei Yeoh, Charles Blazer, Megan Kirkman, and Kim DiPasquale (from left to right)

Above: *Team Freq e Flow* - Amit Malik, Adam Miller, Mark Cukier, and Michael Ducott (from left to right)

Above: *Team Electric Slide Show* - Elly Sirotta, Nelly Medrano, Paul Benson, and Brianna Boroway (from left to right)

4. Graduate Programs

4.1 Course & Program Development

Curriculum Development

During AY 2000-2001, six new graduate courses were developed. Three had been taught previously under the SC500 or SC700 "special-topics" rubrics and have now received permanent numbers in the course registry. The other three were taught or are planned to be taught under the SC700 rubric:

SC520 Digital Image Processing and Communications was taught in Fall 2000 by Professor Janusz Konrad.

SC581 Power Electronics was taught in Spring 2000 by Professor Charles Eddy.

SC700 Advanced Semiconductor Fabrication Technologies was taught in Spring 2001 by Professor Charles Eddy.

SC700 Internet Information Protocols was taught in Spring 2001 by Professor Ari Trachtenberg.

SC700/BE700 Biomedical Optics and Biophotonics was developed by Professor Irving Bigio and is scheduled to be offered in Fall 2001.

SC711 Software Architecture was taught in Spring 2001 by Professor John Brackett.

In addition, three courses had number changes.

SC512 Digital Signal Processing was changed to SC516 to create the DSP sequence SC416, SC516, SC716.

SC509 Simulation was changed to SC514 so that it would match the number of its parent (cross-listed) course MN514.

SC562 Digital Communications was changed to SC515 to create a communications sequence (SC415, SC515, SC715).

Graduate Student Recruitment

The department experienced a 20% drop in domestic applications this year, a situation experienced nationwide due to the abundance of high-paying job opportunities recently available to engineering graduates. We expect application statistics to lag the economy by a year, and the current weakening economy should bring about a banner year in the next application cycle.

On the bright side, five of the six students to whom we offered full scholarships have elected to join us, and we were successful in attracting four of the five applicants from the Peoples' Republic of China (out of 429 applicants!) to whom we offered financial aid. The higher acceptance rate by the better applicants (the scholarship students) may imply that the security that we attach to those offers (guaranteed funding for as long as the student is making progress toward his/her degree) is very important to them. We will consider expanding that guarantee in the next offer cycle. At the time of writing, ECE has open Teaching Fellowship and Research Assistantship slots yet to fill. We need a stronger campaign of advertisement to let students know of the opportunities available in the department.

Teaching-Fellow, Research-Assistant, and Scholarship-student Stipends

All graduate-student remuneration, whether from teaching fellowships (TFs), research assistantships (RAs), or scholarships, is in the form of living stipends and is not considered to be salary. The University has fixed the TF stipend to $13,500 for Academic Year 2001-2002 (two semesters), a $500 increase over the previous year. The College has fixed the RA stipend to the TF stipend for begining RAs and given guidelines for a 5% increase when the RA passes his/her second (of two) PhD Qualifying Exams and another 5% when he/she passes his/her PhD Research Prospectus. These 5% increases shall float above the base TF stipend level, whatever that level may be at any time. The ECE Department has adopted these guidelines as of January 2001. Full-scholarship students receive a stipend $1500 above the base TF stipend for the first year but revert to the existing TF/RA stipend levels in subsequent years. A survey of current graduate students showed that the amount of financial aid is not an important factor in their graduate-school choice just so long as the stipend is livable. Our stipends are higher than most schools'.

Graduate Student Seminars

The weekly or bi-weekly series of ECE Graduate Student Seminars was absorbed again in Fall 2000 into SC850, the Graduate Teaching Fellow Seminar. SC850 was also run in Spring, but, owing to the very small group of new graduate students entering in January, the Graduate Student Seminars were not. The first half of Fall semester was devoted to teaching instruction while the latter half as devoted to research talks by ECE professors, aimed at facilitating the placement of students into the professors' research programs. Lab tours were an emphasized aspect of these talks. The research talks given in the Fall are listed below.

October 27 - Janusz Konrad - 17 students
Multimedia Communications of the Future: Digital Video Over the Internet and Beyond

November 3 - Michael Ruane - 12 students
Modern Magnetics - Attractive Research Opportunities

November 10 - Richard Brower - 7 students
How water gives life to proteins - A Multi-scale Approach to Computation

November 17 - Enrico Bellotti - 7 students
Opportunities in Computational Electronics

December 8 - Charles Eddy - 8 students
Research in the Advanced Electronic Materials and Device Processing Research Laboratory

ECE Colloquium

The ECE Colloquium Series, now in it's third year, continued with prominent speakers from both outside and inside the University. A wide variety of research topics and issues of current importance were highlighted. Graduate students are expected to attend these talks, while the lecture series was open to undergraduate students, along with the rest of the College. A listing of the 2000-2001 Colloquium speakers can be found in Section 4.9.

Graduate Teaching Fellows (GTFs)

ECE's allocation of the College of Engineering's 53 GTF slots has increased from 17 to 19 to 20 to 21 over the past 4 years but will decrease back to 20 for AY01-02. This drop in GTF slots is largely a round-off effect that did not go our way this time. ECE also provides an additional GTF (and a professor) to teach the Electric Circuits course in the BU Metropolitan College Science and Engineering Program, most of whose students join the College of Engineering formally in their junior year.

Undergraduate Teaching Fellows (UTFs)

ECE instituted a trial UTF program in AY99-01, partially to give our best undergraduates a higher-level experience in their academic programs, but also to interest them in staying for graduate school. These UTFs have recently taken the courses with which they are assigned to help, and they have been found to form an invaluable resource for the professors and for the GTFs, who often have not had previous student or teaching experience with the specific course material.

ECE hired four UTFs in Spring 2001. The Circuits UTF received better evaluations than did the course GTFs. The Electromagnetics UTF performed very well and acted essentially as the course GTF as the course enrollment did not warrant GTF help. Computer Organization was given two UTFs, owing to its large enrollment and a GTF new to the course. One of these two essentially ran the lab, a key aspect of the course, while the other performed well on other duties but had to curtail activity toward the end of the semester as her senior project came to dominate her life.

New MS Degree in Photonics

The ECE Department has initiated the approval process for a new MS in Photonics degree program. Photonics has become an important enabling technology, an established field for research, and a growing area for graduate education. Few universities offer a specific graduate degree in this area, and Boston University is poised to be among the leaders of this important new field. We have an outstanding Photonics Center, incubator activity in photonics, a distinguished faculty, and a well-developed series of courses to train students for industry, government labs, or an academic research career. As course enrollments have grown in this area, discussions concerning this program have been ongoing for several years. Most importantly, the industry has matured and photonics is recognized as a key technology for communications, materials processing, computing, and consumer electronics.

4.2 New Matriculants

New Students Entering 2000-2001

		Male	Female	FT	PT	GTF	RA	Fellow	Other
MS	US	10	2	8	4	3	3	0	6
	Intl.	14	5	18	1	3	3	1	0
Ph.D.	US	9	2	10	1	4	6	1	3
	Intl.	14	3	17	0	6	9	1	0
TOTAL		**47**	**12**	**53**	**6**	**16**	**21**	**3**	**9**

GRE Scores

Fall 2000 Mean GRE Scores

		Verbal	%	Quantitative	%	Analytical	%
MS	US	497	57	719	80	607	80
	Intl.	498	59	769	91	682	80
P.hD.	US	511	59	741	84	664	75
	Intl.	589	77	791	95	737	89
Mean		**524**	**63**	**755**	**88**	**673**	**81**

Spring 2001 Mean GRE Scores

		Verbal	%	Quantitative	%	Analytical	%
MS	US	517	51	720	82	662	73
	Intl.	529	65	760	91	678	76
Ph.D.	US	453	45	773	93	643	68
	Intl.	545	65	778	94	703	84
Mean		**511**	**57**	**756**	**90**	**672**	**76**

4.4 MS Students

Electrical Engineering and Computer Systems Engineering

Student Name	*Advisor*	*Research Area or Thesis*
Abou-Amarah, Izzat	Nawab	Quantum Optical Imaging
Adhikari, Chandan	Skinner	Computer Systems Engineering
Agarwal, Anurag	Karpovsky	Multicasting Algorithms in Network of Workstations
Agarwal, Sachin	Trachtenberg	Fast Data Synchinization in PDAs
Agha, Mazen	Karpovsky	Computer Systems Engineering
Bach, Edward	Toffoli	Electrical Engineering
Bae, Sunghwan	Skinner	Computer Systems Engineering
Bashar, Fahmida	Brackett	Computer Systems Engineering
Biswas, Santanu	Karpovsky	Electrical Engineering
Blondin, Archie	Skinner	Computer Systems Engineering
Bozinovic, Nikola	Oliver	Electrical Engineering
Broom, Bethany	Nawab	Electrical Engineering
Brown, Garth	Carruthers	Optimization of Distributed Applications in a Cluster Computing Environment
Canikoglu, Ayhan	Skinner	Computer Systems Engineering
Cavanagh, Gregory	Skinner	Computer Systems Engineering
Chan, Kin Fan	Nguyen	Electrical Engineering
Chan, Jeffrey	Moustakas	Solid State, Circuits, & Devices
Chang, Shey-Sheen	Starobinski	Electrical Engineering
Cheema, Randeep	Carruthers	Computer Systems Engineering
Chen, Tai-Chou	Moustakas	Electrical Engineering
Chivas, Robert	Moustakas	Direct Measurement of Polarization Mode Dispersion in Optical Components
Conery, Joseph	Skinner	Computer Systems Engineering
Crager, Joseph	Kotiuga	Computational Electromagnetics
Dawson, Matthew	Brackett	Computer Systems Engineering
Dekow, Gary	Perreault	Electrical Engineering
Deshmukh, Om	Espy-Wilson	Electrical Engineering
Dondurmacioglu, Ozer	Ünlü	Wireless Infrared Communications
Dougherty, Paul	Carruthers	Computer Systems Engineering
Foreman, Eric	Fritz	Satellite/Rocket Instrumentation Design and Data Analysis
Franzen, Nathan	Espy-Wilson	Electrical Engineering
Gunter, Liberty	Eddy	Electrical Engineering
Guo, Ye	Carruthers	Electrical Engineering
Huang, Yingjie	Carruthers	Electrical Engineering
Jaspal, Biren	Oliver	Testing Capacity of Infrared Channels
Juneja, Amit	Karl	Speech Recognition
Kahric, Zoran	Smits	Electrical Engineering
Kannan, Prasanna	Carruthers	Communication Systems
Kassouf, Nadim	Carruthers	Electrical Engineering

Electrical Engineering and Computer Systems Engineering

Student Name	*Advisor*	*Research Area or Thesis*
Katz, Andrew	Roziner	Computer Systems Engineering
Kiely, Matthew	Carruthers	Computer Systems Engineering
Kim, Soojin	Karl	Electrical Engineering
Kim, Duk Joong	Horenstein	Electrical Engineering
Kim, Sang-Hoon	Brackett	Computer Systems Engineering
Krishnamoorthy, Vishwanathan	Nguyen	Electrical Engineering
Lander, Todd	Skinner	Computer Systems Engineering
Lane, Keith	Vidale	Electrical Engineering
Lee, Dong-Hoon	Carruthers	Communication
Leyfer, Michael	Perreault	Computer Systems Engineering
Lim, Eric	Nawab	Electrical Engineering
Liu, Ying-Tsang	Sergienko	Electrical Engineering
Liu, Guojing	Skinner	Computer Systems Engineering
Mathur, Raman	Carruthers	Electrical Engineering
Mc Mahon, Dara	Castañon	Electrical Engineering
Mei, Kao-Chi	Karpovsky	Computer Systems Engineering
Murphy, Scott	Hubbard	Electrical Engineering
Nguyen, Nguyen	Kincaid	Electrical Engineering
Onat, Burak	Skinner	Computer Systems Engineering
Pazhayanur-Shanmukham, Parvathy	Carruthers	Electrical Engineering
Rho, Mina	Vidale	Computer Systems Engineering
Rykalova, Yelena	Levitin	Computer Systems Engineering
Shah, Jay	Schubert	Electrical Engineering
Shaikh, Shoeib	Hubbard	Electrical Engineering
Shenoy, Ananth	Giles	Computer Systems Engineering
Shivakumar, Priya	Kincaid	Computer Systems Engineering
Siddiqui, Matheen	Oliver	Computer Systems Engineering
Silva, Elsa	Vidale	Computer Systems Engineering
Sioufi, Ralph	Karpovsky	Computer Systems Engineering
Su, Bangliang	Perreault	Computer Systems Engineering
Tang, Songyue	Oliver	Computer Systems Engineering
Varghese, Joseph	Carruthers	Electrical Engineering
Wang, Tong	Morse	Electrical Engineering
Wang, Yu	Brackett	Computer Systems Engineering
Whiting, Andrew	Sergienko	Electrical Engineering
Williams, Adrian	Oliver	Electrical Engineering
Wilson, Danielle	Nawab	Modeling for Better Control of Czochralski Crystal Growth
Wynne, Rosalind	Sergienko	Electrical Engineering
Xu, Xiangdong	Carruthers	Network Communication
Zuo, Yingtao	Castañon	Multimedia Networks

4.5 Ph.D. Students

Electrical and Computer Engineering

Student Name	*Research Advisor*	*Research Area or Thesis Title*
Abouraddy, Ayman	Saleh	Quantum Optical Imaging
Abu Ayyash, Salma	Nawab	Signal Processing - Using Knowledge-based Techniques to Perform Signal Decomposition on EMG Signals
Acosta, Juan	Trachtenberg	Computer Engineering
Al-Awadhi, Ayman	Carruthers	Computer Engineering
Aleksanyan, Arnak	Karl	Solid State Devices
Basu, Prithwish	Little	Wireless Ad Hoc Networks, Scalable Video Delivery
Bergstein, David	Eddy	Electrical Engineering
Beriont, Walter	Little	Computer Engineering
Bhattacharyya, Anirban	Moustakas	Electrical Engineering
Biswas, Mainak	Nguyen	Electrical Engineering
Bynoe, Wayne	Carruthers	Broadband Wireless LANs
Cabalu, Jasper	Moustakas	Electrical Engineering
Carroll, Sarah	Carruthers	Wireless Communication Networks
Cetin, Mujdat	Karl	Statistical Processing of Synthetic Aperture Radar Signals
Chen, Ying-Jui	Nguyen	Detection, Low-cost (integer) Implementation of Transform
Choi, Jeeyae	Brackett	A Language and an Authoring Tool for the Creation of Clinical Guidelines
Colerico, Marlene	Mendillo	Electrical Engineering
Collier, Charles	Morse	Electrical Engineering
Dobson, Jennifer	Ünlü	Electrophysics
Dosunmu, Olufemi	Ünlü	Electrical Engineering
Eakman, Gregory	Brackett	A Scalable Approach to Automated Object-Oriented Integration Testing
Emsley, Matthew	Ünlü	Electrical Engineering
Feng, Haihua	Castañon	Electrical Engineering
Fujimoto, Koji	Smits	Electrical Engineering
Gokkavas, Mutlu	Ünlü	Electrical Engineering
Gong, Yao	Karl	Electrical Engineering
Graff, John	Schubert	Electrical Engineering
Guo, Xiaoyun	Schubert	White Light Emitting Diode
Gupta, Shameek	Karpovsky	Computer Engineering
Harris, Garrett	Chakrabarti	Computer Engineering
Hasan, Qadeer-Ul	Levitin	Computer Engineering
Hinck, Todd	Hubbard	Extending the Smart Pixel Paradigm: Integrated Image Acquisition and Imaging Processing Circuitry
Hitchings, Darin	Konrad	Systems Engineering
Hochstein, Lorin	Nawab	Signal Processing
Iliopoulos, Eleftherios	Moustakas	Growth, Modelling and Optoelectronic Properties of Ordered III-V Nitride Alloys
Ippolito, Stephen	Ünlü	Electrical Engineering
Iyer, Sandeep	Moustakas	GaN Thin Films
Jastrzebski, Piotr	Lee	Trans-hemispheric Propagation of the VLF Signals in the Presence of Ionospheric HF Heating
Jeong, Jonghoon	Teich	Electrical Engineering
Jones, Lawrence W.	Carruthers	Computer Engineering
Kamalabadi, Farzad	Chakrabarti	Tomographic Remote Sensing of Space Plasmas Using Spectroscopic Measurements
Karl, Christian	Hubbard	Electrical Engineering
Karra, Maria	Fritz	Energetic Particles in the Earth's Magneto Sphere

Electrical and Computer Engineering

Student Name	*Research Advisor*	*Research Area or Thesis Title*
Kaur, Parminder	Trachtenberg	Computer Engineering
Ke, Wang	Little	Multimedia Networks, Video-on-Demand Systems
Krishnan, Rajesh	Little	Computer Engineering
Lang, Li	Castañon	Image Processing/BDU method
Latlippe, Traci	Chakrabarti	Electrical Engineering
Laurent, Sophie	Mendillo	Tomography on Auroras
Li, Yun-Li	Schubert	Electrical Engineering
Li, Xiaojun	Morse	High Power Fiber Laser
Li, Weiping	Moustakas	Electrical Engineering
Lin, Bosheng	Mendillo	Electrical Engineering
Litvin, Andrey	Karl	Space Physics
Liu, Huajun	Perreault	Networking, Microcomputer systems
Liu, Chenhui	Levitin	Natural Language Understanding Using Statistical Models
Mao, Junjie	Perreault	Computer Engineering
McNerney, Peter	Nguyen	Electrical Engineering
Meng, Lingmin	Nguyen	Template-based Approaches for Human Face Detection and Classification
Morrissey, Ronald	Humphrey	Grooved Magnetic Materials
Mustafa, Mehmet	Karpovsky	Reliable Computing
Nam, Kyung	Moustakas	Growth of GaN on Pre-Patterned Substrates by Vapor Phase Epitaxy for Optoelectronic Applications
Nasr, Magued	Schubert	Quantum Optics
Natchev, Natcho	Levitin	Network Computing
Nelson Kenric	Ruane	Overwrite Noise in Phase-Change Optical Storage
Pavlovich, Julia	Karl	Electrical Engineering
Perreault, Julie	Horenstein	MEMS
Polimeni, Jonathan	Schwartz	Computational Neuroscience, Computer Vision, AVLSI
Ray, Saikat	Oliver	Electrical Engineering
Ristivojevic, Mirko	Nawab	Electrical Engineering
Sampath, Anand	Moustakas	Solar-blind P-I-n AlGaN Photodetectors
Shapurian, Golnaz	Nguyen	Electrical Engineering
Shaw, Matthew	Sergienko	Quantum Optics
Shi, Yonggang	Karl	Signal Processing
Shi, Yi	Oliver	Computer Engineering
Shu, Chang	Perkins	Systems Engineering
Singh, Pramod	Nguyen	Electrical Engineering
Singh, Rajwinder	Eddy	High Density Plasma Processing of Nitride Semiconductors
Toussaint, Kimani	Ruane	Electrical Engineering
Varoglu, Yavuz	Carruthers	Systems Engineering
Vassilaras, Spyridon	Castañon	Telecommunication Networks
Walton, Zachary	Toffoli	Computer Engineering
Wedzinga, Gosse	Carruthers	Photonic Slot Routing: A Scalable Solution for Transparent Optical Transport Networks
Weisenseel, Robert	Karl	Sensor Fusion for Subsurface Object Detection
Wotiz, Robert	Nawab	Knowledge Based Signal Processing
Wu, Yen-Hung	Oliver	Electrical Engineering
Yang, Zibing	Hubbard	VLSI Circuit Design
Yarnall, Timothy	Teich	Electrical Engineering
Ying, Zhengrong	Castañon	Object Recognition

MS Degrees Awarded	
Electrical Engineering	14
Computer Systems Engineering	17
TOTAL	**31**

Ph.D. Degrees Awarded	
Electrical Engineering	4
Systems Engineering	1
TOTAL	**5**

4.6 Graduate Teaching Fellows

Fall 2000

Student Name	Course
Anurag Agarwal	SC 311
Arnak Aleksanyan	SC 401
David Bergstein	SC 466
Jasper Cabalu	Photonics Lab
Matthew Dawson	SC 312
Liberty Gunter	SC 410
Shameek Gupta	SC 571
Garrett Harris	SC 311
Darin Hitchings	SC 447
Vishwanathan Krishnamoorthy	SC 415
Peter McNerney	SC 330
Burak Onat	SC 312
Jonathan Polimeni	SC 401
Saikat Ray	SC 410
Mirko Ristivojevic	SC 450
Ananth Shenoy	EK 317
Matheen Siddiqui	SC 546
Pramod Singh	SC 416
Banliang Su	EK 307
Andrew Whiting	SC 455
Adrian Williams	SC 410
Rosalind Wynne	SC 410

Spring 2001

Student Name	Course
Anurag Agarwal	SC 311
Arnak Aleksanyan	SC 401
Fahmida Bashar	SC 546
David Bergstein	SC 466
Santanu Biswas	EK 307
Jasper Cabalu	SC 471
Shey-Sheen Chang	EK 307
Matthew Dawson	SC 511/700/711/912
Paul Dougherty	EK 307
Liberty Gunter	SC 410
Shameek Gupta	SC 571
Darin Hitchings	SC 447
Parminder Kaur	EK 307
Raman Mathur	EK 307
Peter McNerney	SC 330
Burak Onat	SC 312
Jonathan Polimeni	EK 318
Saikat Ray	SC 415
Mirko Ristivojevic	SC 450
Pramod Singh	SC 401
Andrew Whiting	SC 563/570
Rosalind Wynne	SC 512

Summer 2001

Qadeer Hasan	SC 410
Darin Hitchings	SC 447
Parminder Kaur	EK 307
Raman Mathur	SC 311

4.7 Research Assistants

Student	Advisor	
Abouraddy, Ayman	Saleh	
Agarwal, Sachin	Trachtenberg	
Amsden, Jason	Ruane	
Atature, Mete	Sergienko	(Physics)
Bach- Davis, Edward	Toffoli	
Bashar, Fahmidah	Ruane	
Basu, Prithwish	Little	
Biswas, Mainak	Nguyen	
Biswas, Santanu	Starobinski	
Blasche, Gregory	Goldberg/Ünlü	(Physics)
Booth, Mark	Teich	(BME)
Bozinovic, Nikola	Konrad	
Broom, Bethany	Espy-Wilson	
Cabalu, Jasper	Moustakas	
Carroll, Sarah	Carruthers	
Cetin, Mujdat	Karl	
Chan, Jeffrey	Moustakas	
Cheema, Randeep	Starobinski	
Chen, Hongqiang	Hubbard	(BME)
Chen, Tai-Chou	Moustakas	
Chen, Ying-Jui	Nguyen	
Chivas, Robert	Morse	
Colerico, Marlene	Mendillo	
Deshmukh, Om	Espy-Wilson	
Dobson, Jennifer	Ünlü	
Dosunmu, Olufemi	Ünlü	
Dougherty, Paul	Ruane	
Emsley, Matthew	Ünlü	
Foreman, Eric	Fritz	
Franzen, Nathan	Espy-Wilson	
Friel, Ian	Moustakas	
Fujimoto, Koji	Smits	
Gokkavas, Mutlu	Ünlü	
Graff, John	Schubert	
Guo, Xiaoyun	Schubert	
Hinck, Todd	Hubbard	
Hitchings, Darin	Castañon	
Iliopoulos, Eleftherios	Moustakas	
Ippolito, Stephen	Ünlü	
Iyer, Sandeep	Moustakas	(MFG)
Juneja, Amit	Espy-Wilson	
Kannan, Prasanna	Carruthers	
Karl, Christian	Hubbard	
Ke, Wang	Little	
Kim, Duk Loong	Hubbard	
Laurant, Sophie	Mendillo	
Li, Weiping	Moustakas	
Li, Yun-Li	Schubert	
Litvin, Andrey	Karl	
Liu, Haijun	Perreault	
Liu, Ying Tsang	Sergienko	
Liu, Zhiheng	Goldberg	(Physics)
Meng, Lingmin	Nguyen	
Nam, Kyung Jun	Nguyen	
Narayanan, Suresh	Castañon	(AME)
Nasr, Magued	Teich/Saleh	
Pavlovich, Julia	Karl	
Pazhayanur-Shanmukham, Parvathy	Carruthers	
Perreault, Julie	Horenstein	
Polimeni, Jonathan	Schwartz	
Ristivojevic, Mirko	Konrad	
Sampath, Anand	Moustakas	
Shah, Jay	Schubert	
Shaw, Matthew	Sergienko	
Shi, Yi	Cassandras	
Shi, Yonggang	Karl	
Singh, Rajwinder	Eddy	
Tong, Yunjie	Goldberg/Ünlü	(Physics)
Toussaint, Kimani	Sergienko	
Ulu, Gokhan	Ünlü	(Physics)
Varghese, Joseph	Oliver	
Waldron, Erik	Schubert	(Physics)
Walton, Zachary	Sergienko	
Weisenseel, Robert	Karl	
Williams, Adrian	Teich	
Worth, Colin	Goldberg/Ünlü	(Physics)
Wotiz, Robert	Nawab	
Wynne, Rosalind	Morse	
Yang, Zibing	Mountain	
Yarnall, Timothy	Teich/Sergienko/Saleh	
Yin, Yan	Goldberg	(Physics)
Ying, Zhengrong	Castañon	

4.8 Graduate Courses

Course Number and Title	Fall 00	Spring 01	Summer 01
SC 500 Special Topics in ECE	Morse		
SC 500 Special Topics in ECE	Konrad		
SC 501 Dynamic Systems Theory	DuPont		
SC 504 Advanced Data Structures	Trachtenberg		
SC 505 Stochastic Processes	Karl	Castañon	
SC 509 System Simulation	Vakili		
SC 511 Software Systems Design	Vidale	Vidale	
SC 512 Digital Signal Processing	Nguyen	Nguyen	
SC 513 Computer Architecture	Skinner		
SC 518 Software Project Management	Brackett		
SC 524 Optimization Theory and Methods	Paschalidis		
SC 533 Introduction to Discrete Mathematics	Levitin		
SC 534 Stochastic Models in Engineering		Levitin	
SC 546 Computer Communications and Networks	Carruthers	Starobinski	
SC 560 Introduction to Photonics	Teich		
SC 561 Error-Control Codes	Karpovsky		
SC 562 Digital Communication	Ruane		
SC 563 Fiber-Optic Communication Systems		Morse	
SC 570 Lasers and Applications		Teich	
SC 571 VLSI Principles and Applications	Knepper	Knepper	
SC 571 VLSI Principles and Applications	Hubbard		
SC 572 VLSI Design Project	Hubbard		
SC 575 Semiconductor Devices	Bellotti		
SC 577 Solid State Devices		Moustakas	
SC 700 Advanced Topics in ECE		Eddy	
SC 700 Advanced Topics in ECE		Trachtenberg	
SC 700 Advanced Topics in ECE		Little	
SC 710 Dynamic Programming and Stochastic Control	Caramanis		
SC 711 Software Architecture		Brackett	
SC 715 Wireless Communication		Carruthers	
SC 716 Advanced Digital Signal Processing	Nawab		
SC 717 Image Reconstruction and Restoration		Karl	
SC 719 Statistical Pattern Recognition	Castañon		
SC 730 Informational-Theoretical Design of Algorithms		Levitin	
SC 749 Interconnection Networks for Multicomputers	Karpovsky		
SC 752 Theory of Computer Harware Testing		Karpovsky	
SC 757 Advanced Microprocessor Design		Perreault	
SC 760 Advanced Topics in Photonics	Schubert		
SC 761 Information Theory and Coding	Levitin		
SC 770 Integrated Optoelectronics		Ünlü	
SC 772 VLSI Graduate Design Project	Hubbard		

Course Number and Title	Fall 00	Spring 01	Summer 01
SC 850 Graduate Teaching Seminar	Nawab/Oliver	Nawab/Oliver	
SC 891 Seminar: Computer Systems Engineering	Faculty	Faculty	
SC 892 Seminar: Electro-Physics	Faculty	Faculty	
SC 900 Research	Faculty	Faculty	Faculty
SC 901 Thesis	Faculty	Faculty	Faculty
SC 910 Computer Enginnering Design Project	Faculty	Faculty	Faculty
SC 911 Systems Enginnering Design Project	Faculty	Faculty	Faculty
SC 912 Software Enginnering Design Project	Faculty	Faculty	Faculty
SC 913 Electrical Engineering Design Project	Faculty	Faculty	Faculty
SC 939 Continuing Study	Faculty	Faculty	Faculty
SC 951 Independent Study	Faculty	Faculty	Faculty
SC 991 Dissertation	Faculty	Faculty	Faculty

4.9 ECE Colloquium and Seminars

Date	Speaker	Title
*September 20	Saman Amarasinghe Laboratory for Computer Science, Department of EE and CS, MIT	Practical Compiler Techniques for Detecting Parallelism
September 25	Conor Heneghan University College, Dublin	Customizing the Wavelet Transform for Compression Using the Lifting Scheme
*September 27	Thomas Silva National Institute of Standards and Technology, Boulder, CO	Consideration of the Spherical Cow: The realities of Magnetodynamics in an ImperfectWorld
October 5	Andy Tsai SSG group, MIT	A Curve Evolution Implementation of the Mumford-Shah Functional for Image Segmentation, Denoising, Interpolation, and Magnification
*October 11	Eric Miller ECE Department, Northeastern University	Limited Veiw Tomographic Imaging
October 12	Kinh Tieu Learning and Vision Group, AI Laboratory, MIT	Boosting Image Retrieval
*October 13	Benjamin Melamed Department of Management Science & Information Systems Rutgers University	The Empirical Test Modeling Methodology:Theory and Applications
*October 18	Michael Negnevitsky EE and CS Department University of Tasmania, Australia	Evolutionary Computation: Can Evolution be Intelligent
October 19	Ying-Jui Chen MDSP Lab, Boston University	Integer DCT and Applications to Compression
*October 25	Michael Mitzenmacher CS Department Harvard University	On New Erasure and Error-Correcting Codes

Date	Speaker	Title
*November 1	Gene Cooperman CS Department, Northeastern University	Task Oriented Parallel C
November 2	Martin Wainwright Stochastic Systems Group, MIT	Random Cascades of Gaussian Scale Mixtures on Wavelet Trees and Their Use in Analyzing and Modeling Natural Images
*November 8	Mikhail Vorontsov Army Research Laboratory Adelphi, MD	High-Resolution Wavefront Control: New Paradigms for Adaptive/Active Optics and Image Processing
November 9	Haihua Feng MDSP Lab Boston University	Image Reconstruction using Object-Based Regularization and Tomographic Flows
November 16	Kelly H. Zou Harvard Medical School BWH	Receiver Operating Characteristic (ROC) Curve Analysis for Signal Detection and Analysis of Medical Diagnostic Tests
November 29	David L. Harame SiGe Simulation, Modeling and Design IBM Microelectronics	Status and Trends in SiGe HBT BiCMOS Technology
*November 29	Jim Modestino Electrical, Computer and Systems Engineering, RPI	Network Transport of Digital Video: A Joint Source-Channel Approach
November 30	Zhengrong Ying MDSP Lab, Boston University	Correspondence for Nonrigid Object Recognition
December 5	Phil Casini Cradle Technologies	A Revolutionary New Chip that Powers the "Stream Processing" Platform
December 14	Jun Liu Statistics Department Harvard University	From Chain Polymers To Nonlinear Dynamic Systems: A Sequential Monte Carlo Point of View
December 20	Frederic Precioso INRIA, Sophia-Antipolis, France	Video Object Segmentation - Application to MPEG-4
January 25	Vincenzo Galdi MDSP Lab, Boston University	Short-pulse Two-dimensional Scattering by Moderately Rough Interfaces via Quasi-ray Gaussian Beams
*January 31	Xiang-Dong Cao Nortel Networks/Qtera Division	Toward Next Generation Optical Internet
February 8	Sandy Wells Brigham and Womens' Hosp./ Harvard Med. School	Object Acquistion by Inverse Volume Rendering
February 14	Mark Kon Mathematics Department Boston University	Radial Basis Function Neural Networks
February 14	Ali Abdi University of Minnesota	Space-Time Correlation Modeling of Multielement Antenna Systems
February 15	Mujdat Cetin MDSP Lab, Boston University	Feature-Enhanced Synthetic Aperture Radar Imaging
February 16	Yuval Shavitt Bell Labs & Tel-Aviv University	S-QMRP: An Internet QoS-aware MUlticast Routing Protocol
February 20	Martin Herbordt ECE Department University of Houston	Switch Design for Multicomputers-on-a-Chip

Date	Speaker	Title
February 23	Katerina Goseva-Popstojanova ECE Department Duke University	Approaches to Software Reliability Assessment
February 26	Richard Radke Princeton University	Estimation Problems in Digital Video
*February 28	John MacChesney Lucent Technologies	Anticipation of Material Needs for Emerging Optical Communications Systems
February 28	Harley Johnson AME Department Boston University	Mechanics of Quantum Dots: From Deposition to Photoluminescence
March 12	Cihan Tepedelenlioglu University of Minnesota	Modeling and Mitigation of Time- and Frequency-Selective Fading in Single- and Multi-Carrier Communications
*March 14	Randy Giles Bell Laboratories/Lucent	Lightwave Micromachines
March 14	Tommaso Toffoli ECE Department Boston University	Adiabatic Charge Transfer - From Diffusive to Ballistic Computing
March 15	Dongyan Xu Univ. of Illinois, Urbana-Champaign	Building a Network of Ubiquitious Multimedia Services
March 15	Julia Pavlovich MDSP Lab, Boston University	Time-Domain Reconstruction of Moderately Rough Interfaces Via Quasi-ray Gaussian Beams
March 22	Margrit Betke Computer Science Department Boston University	Chest CT: Nodule Detection and Assessment of Change Over Time
March 26	Natalia I. Afanasyeva Physics Department University of Nevada, Reno	Fiberoptic Vibrational Spectroscopy for Numerous Biomedical, Environmental, and Industrial Applications
*March 28	Charles R. Eddy, Jr. ECE Department Boston University	High Density Plasma Processing for Advanced Devices
March 28	Vincenzo Galdi ECE Department Boston University	Gabor-Based Gaussian Beam Algorithms for Rough Surface Scattering and Reconstruction
March 30	Saligrama Venkatesh Laboratory for Information and Decision Systems, MIT	Statistical Signal Processing in Unknown and Non-stationary Environments
	Kai-Kuang Ma ECE Department Nanyang Tech. Univ., Singapore	Content-Based Video Indexing and Retrieval: Generating Motion Trajectory from MV field
April 4	Erica Carlson ECE Department Boston University	Building a High Temperature Superconductor
	Valeriu Beiu RN2R LLC Dallas, TX	On VLSI-Optimal Neural Computations: How much analog processing do we need?
	Yonggang Shi MDSP Lab, Boston University	Region-based Regularization for Tomographic Reconstruction
April 10	James G. Goodberlet Nano-Structures Library, MIT	Sub-100-nm Patterning Using Conformable-Contact Photolithography

Date	Speaker	Title
*April 11	Jeffrey Carruthers ECE Department Boston University	Small Wireless Networks: Challenges for Radio and Lightwave Systems
	Seth Lloyd Manufacturing Engineerng, MIT	Computational Capacity of the Universe
April 12	Andrey Litvin MDSP Lab, Boston University	Shape Modeling using Maximum Enthropy Principle
April 13	Pamela Abshire Sensory Communication & Microsystems Laboratory The Johns Hopkins University	Sensory Information Processing Under Physical Constraints
April 19	Yuan Qi Media Lab, MIT	Automatic Relevance Determination for the Bayes Point Machine
April 23	Michael Brandstein Division of Engineering & Applied Sciences Harvard University	Audio and Video Signal Acquisition in Challenging Environments: Current Research at the Harvard Intelligent Multi-Media Environments Laboratory (HIMMEL)
April 25	Richard Brower ECE Department Boston University	What is String Theory?
	Michal Lipson Center for Material Science & Engineering, MIT	SI Microphotonics and Microcavities
May 10	Raymond C. Chan HST of Harvard-MIT	Non-invasive Ultrasound Monitoring of Regional CarotidWall Structure and Deformation inAtherosclerosis
May 10	Gyungho Lee ECE Department Iowa State University	Access Region Cache: A Scalable Memory Pipeline for Wide-Issue Processors
May 16	Michael Ruane ECE Department Boston University	Optical Data Storage - Media Choices
May 23	Enrico Bellotti ECE Department Boston University	Polarization Effects in Non-cubic Semiconductors and Related Devices
May 30	Robert Kotigua ECE Department Boston University	Time Domain Analysis of High Perfomance Interconnects - Respecting the Electromagnetic Details
May 31	Kyungh Oh Kwanju Institute of Science and Technology, Kwanju, Korea	Structured Cladding Fibers and Their Applications in Optical Fiber Devices

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E. Fred Schubert
April 20, 2001

High-Speed Photodetectors for Optical Communications
M. Selim Ünlü
April 27, 2001

Ultra-Resolution Microscopy
Bennett B. Goldberg and M. Selim Ünlü
May 4, 2001

Optical Networks
Bahaa Saleh
May 11, 2001

Optical Data Storage
Michael Ruane
May 18, 2001

Successful e-Business Projects: Managing for Results
John Brackett
June 4 -8, 2001

Wireless Communication: Understanding Mobile Pico-Networks
Jeffrey B. Carruthers
June 14, 2001

The Controller Area Network (CAN)
David Perreault
June 22, 2001

5. Research

5.1 Areas of Research

Electro-Physics

Coordinator: Michael Ruane

Solid-State Materials and Devices

- Bellotti
- Campbell
- Eddy
- Humphrey
- Knepper
- Moustakas
- Schubert
- Skocpol

Photonics

- Bigio
- Carruthers
- Eddy
- Goldberg
- Kincaid
- Levitin
- Morse
- Moustakas
- Ruane
- Saleh
- Schubert
- Sergienko
- Teich
- Ünlü

Electromagnetics

- Fahim
- Felsen
- Fritz
- Giles
- Horenstein
- Humphrey
- Kotiuga
- Lee
- Mendillo
- Oliver

Information Systems & Sciences

Coordinator: William Clem Karl

Signal & Image Processing

- Carruthers
- Castañon
- Karl
- Kincaid
- Konrad
- Mendillo
- Nawab
- Nguyen
- Oliver
- Teich

Speech & Auditory Processing

- Espy-Wilson
- Kincaid
- Nawab
- Nguyen
- Teich

Systems & Control

- Castañon
- Karl
- Vidale

Computer Engineering

Coordinator: Richard Vidale

Computer & Communication Networks

- Carruthers
- Hubbard
- Karpovsky
- Levitin
- Perreault
- Roziner
- Skinner
- Starobinski
- Toffoli
- Trachtenberg

Software Applications

- Brackett
- Brower
- Castañon
- Giles
- Knepper
- Kotiuga
- Levitin
- Little
- Nawab
- Perreault
- Schwartz
- Skinner
- Toffoli
- Trachtenberg
- Vidale

Hardware

- Hubbard
- Karpovsky
- Knepper
- Perreault
- Toffoli

5.2 Publications

Book Chapters

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Journal Articles

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A. Trachtenberg, **M. Karpovsky**, **L. B. Levitin**, "Connections Between Data Reconciliation and Generalized Error correcting Codes," *IEEE International Symposium on Information Theory*, ISIT-2001 (Washington, D.C., June 2001).

G. E. Bunea, **M.S. Ünlü**, and **B.B. Goldberg**, "Time and Spatially Resolved Micro-Photoluminescense Studies of GaN Films," *Materials Research Society Proceedings* (Fall 2000).

M. K. Emsley and **M. S. Ünlü**, "Epitaxy-ready Reflecting Substrates for Resonant Cavity Enhanced Si Photodetectors," *Proc. of IEEE LEOS Annual Meeting* (San Juan, PR, November 2000).

M. S. Ünlü, W. D. Herzog, and **B. B. Goldberg**, "Beam Steering in Narrow-stripe, High-power 980 nm Laser Diodes," *Proc. of IEEE LEOS Annual Meeting* (San Juan, PR, November 2000).

M.S. Ünlü, "Near-field Scanning Optical Microscopy and Spectroscopy," *ENSOMA Workshop* (Regensburg, Germany, November 2000).

N. Biyikli, I. Kimukin, E. Özbay, M. Gökkavas, and **M. S. Ünlü**, "High-speed Transparent Indium-Tin-Oxide Based Resonant Cavity Schottky Photodiode with Si3N4/SiO2top Bragg Mirror," *OSA Topical Meeting, Ultrafast Electronics and Optoelectronics* (Lake Tahoe, NV, January 2001).

Z. Liu, **M. S. Ünlü**, and **B. B. Goldberg**, "Time Resolved Micro-PL Spectroscopy of Individual Quantum Dots," *ORAL Session* (Seattle, WA, March 2001).

N. Biyikli, I. Kimukin, O. Aytür, E. Özbay, M. Gökkavas, and **M. S. Ünlü**, "45 GHz Bandwidth-efficiency ed Resonant Cavity Enhanced ITO Schottky Photodiodes," *Optical Fiber Conference* (Anaheim, CA, March 2001).

G. Ulu, M. Gökkavas, **M. S. Ünlü**, E. Özbay, I. Kimukin, N. Biyikli, R. P. Mirin, D. H. Christensen, "Ultrafast Photodetectors Compatible with VCSEL-based Optical Communications," *New England Chapter of the American Vacuum Society, Syposium 2001, Photonics Session* (June 2001).

Patents & Patent Disclosures

C. Espy-Wilson and K. Xia, "A Knowledge-based Formant Tracker," U.S. Provisional Patent Application (June 2001).

A. Salomon and **C. Espy-Wilson**, "Automatic Adaptation of Temporal Resolution for Speech Signal Processing," U.S. Provisional Patent Application (June 2001).

C. Espy-Wilson, A. Salomon and O. Deshmukh, "Periodic/Aperiodic/Silence Detector," U.S. Provisional Patent Application (June 2001).

B. B. Goldberg and **M. S. Ünlü**, "Ultra-sensitive Biochip Arrays using Waveguide Phase Tomography Techniques," Provisional Patent Filed (July 2000).

T. F. Morse, J. Hernandez-Cordero, **V. Kozlov**, and **M. S. Ünlü**, "A Tunable, Frequency Stable Laser Source for Telecommunications Applications," disclosed to Boston University Patent Office (August 2000).

T. D. Moustakas, "Method for the Preparation and Doping of Highly Insulating Monocrystalline Gallium Nitride Thin Films," US Patent No. 6,123,768 (September 2000).

M. S. Ünlü, **B. B. Goldberg**, **A. K. Swan**, "Spectral Imaging for Vertical Sectioning of Surface Bound Markers," Provisional Patent (2000).

M. S. Ünlü, **B. B. Goldberg**, L. Moiseev, Y. Tong, G. Ulu, S. Lipoff, and C. Wicks, "Waveguide Excitation Platform for Fluorescence Microscopy to Discriminate Against Non-Specific Binding," disclosed to Boston University Patent Office (August 2000).

M. S. Ünlü, **B. B. Goldberg**, and C. Worth, "Waveguide Sensors Optimized for Discrimination Against Non-specific Binding," Provisional Patent Filed (July 2000), Full Patent Filed (July 2001).

M. S. Ünlü, **B. B. Goldberg**, S. B. Ippolito, "Numerical Aperture Increasing Lens (NAIL) Techniques for High Resolution Sub-Surface Imaging," Provisional Patent, No. 60/140,138 (July 1999), Full Patent Filed (July 2000).

Invited Lectures & Presentations

I. Bigio, "Optical Pharmacokinetics: Noninvasive, In-situ Measurement of Drug Concentrations in Tissue Using Optical Spectroscopy," Metcalf Lecture, University of Pittsburgh Cancer Institute (January 2001).

I. Bigio, "Potential Applications of Optical Technologies for Prostate Cancer," Int'l. Innovative Solutions for Prostate Cancer Care (San Diego, CA, February 2001).

R. C. Brower, "Glueball Spectrum for QCD from Ads Supergravity Duality," American Physical Society, DPF Meeting (Columbus, OH, August 2000).

R. C. Brower, "Physics in Higher Dimensions: Black Holes, Hot Strings and QCD Glueballs," University of Connecticut Physics Colloquium (October 2000).

R. C. Brower, "Overview of the SDAC Software Effort" and "The current MILC Code," Thomas Jefferson National Laboratory (Newport News, VA, June 2001).

J. B. Carruthers, "High-Bit Rate Wireless Infrared Communications," NSF Wireless Technology Grantees Workshop (Washington, D.C., February 2001).

J. B. Carruthers, "Small Wireless Networks: Challenges for Radio and Lightwave Systems," ECE Colloquium (Boston University, April 2001).

D. Castañon, "Reduced Signature Target Recognition: Progress and Challenges," Wright State University (November 2000).

D. Castañon, "Sensor Management Algorithms for Data Fusion," Joint Services Data Fusion Workshop (Eglin, FL, December 2000).

D. Castañon, "Multitarget Tracking Approaches for Object Recognition," University of Connecticut, Systems Seminar Series (November 2000).

D. Castañon, "Statistical Approaches for Recognition of Partially Obscured Objects," IEEE Control Systems Society Boston Area Seminar (December 2000).

D. Castañon, "Statistical Recognition of Deformable Objects," Seminar, Northeastern University (February 2001).

C. R. Eddy, Jr., "Effective Plasma Processing: The Importance of Understanding Plasma/Surface Interactions," First National Synchrotron Light Source Workshop on Real-time X-ray Studies of Growth and Surface Processing (Upton, NY, January 2001).

C. R. Eddy, Jr., "High Density Plasma Processing for Advanced Devices," ECE Department Colloquium, Boston University (Boston, MA, March 2001).

C. R. Eddy, Jr., "High Density Plasma Processing for Advanced Devices," Naval Research Laboratory Surface Modification Branch seminar (Washington, DC, April 2001).

C. R. Eddy, Jr., "High Density Plasma Processing for Advanced Devices," Boston University Aerospace & Mechanical Engineering Department Colloquium (Boston, MA, April 2001).

S. Eisenberg, "Computational Models of Cardiac Defibrillation," Tenth Anniversary of the Center for Computational Science Symposium, Boston University (November 2000).

C. Espy-Wilson, "Digital Signal Processing Techniques to Improve Artificial Larynx Speech," BU Joint Seminar between

the BME Hearing Research Group and the Medical School Otolaryngology Dept. (July 2000).

L. B. Felsen, "Wave Interactions with Complex Environments, High Frequency Asymptotics, Periodic Structures and Phased Array Antennas, Short-pulse Time Domain Phenomena, Gaussian Beams, Phaser Space Techniques, Wave-oriented Signal Processing," Dept. of Information Engineering, University of Siena, Italy Dean's Distinguished Invitee. Host: Prof. R.Tiberio (March 2001).

L. B. Felsen, "Wave Interactions with Complex Environments, High Frequency Asymptotics, Periodic Structures and Phased Array Antennas, Short-pulse Time Domain Phenomena, Gaussian Beams, Phaser Space Techniques, Wave-oriented Signal Processing," Dept. of Information Engineering, University of Pisa, Italy Host: Prof. G. Manara (April 2001).

L. B. Felsen, "Wave Interactions with Complex Environments, High Frequency Asymptotics, Periodic Structures and Phased Array Antennas, Short-pulse Time Domain Phenomena, Gaussian Beams, Phaser Space Techniques, Wave-oriented Signal Processing," Institute for High Frequency Techniques, Technical University of Munich, Germany. Host: Prof. P. Russer (April 2001).

L. B. Felsen, "Wave Interactions with Complex Environments, High Frequency Asymptotics, Periodic Structures and Phased Array Antennas, Short-pulse Time Domain Phenomena, Gaussian Beams, Phaser Space Techniques, Wave-oriented Signal Processing," Institute for High Frequency Techniques, University of Karlsruke, Germany. Host: Prof. W. Wiesbeck (May 2001).

L. B. Felsen, "Wave Interactions with Complex Environments, High Frequency Asymptotics, Periodic Structures and Phased Array Antennas, Short-pulse Time Domain Phenomena, Gaussian Beams, Phaser Space Techniques, Wave-oriented Signal Processing," Dept. of Electronic and Electrical Engineering, University of Glasgow, Scotland. Host: Prof. J. M.Arnold (May 2001).

L. B. Felsen, "Wave Interactions with Complex Environments, High Frequency Asymptotics, Periodic Structures and Phased Array Antennas, Short-pulse Time Domain Phenomena, Gaussian Beams, Phaser Space Techniques, Wave-oriented Signal Processing," EUROEM (European Electromagnetics) International Symposium, Edinburgh, Scotland. Invited special session dedicated to J. C. Maxwell (May 2001).

T. A. Fritz, "Energetic Particles and the Magnetospheric Cusps, University of Bergen (Bergen, Norway, July 2000).

T. A. Fritz, "Models and experimental data for the stable trapping region of the earth's magnetosphere," COPSAR Symposium PSRB1 on Radiation Belt Models for Solar Maximum, at the 33rd COSPAR Scientific Assembly (Warsaw, Poland, July 2000).

T. A. Fritz, "Energetic Particles and the Magnetospheric Cusps," Finish Meteorological Institute Seminar (Helsinski, Finland, August 14, 2000).

T. A. Fritz, "Energetic Particles and the Magnetospheric Cusps,' Max Planck Institute for Aeronomy Seminar (Kathlenburg-Lindau, Germany, August 2000).

T. A. Fritz, "Energetic Particles and in the Equatorial Magnetosphere-New Insights," Max Planck Institute for Aeronomy Seminar (Kathlenburg-Lindau, Germany, August 2000).

T. A. Fritz, "Energetic Particles and the Magnetospheric Cusps," University of Leicester (Leicester, UK, August 31, 2000).

T. A. Fritz, "Energetic Particles and the Magnetospheric Cusps," University of Warwick (Coventry, UK, September 1, 2000).

T. A. Fritz, "Energetic Particles and the Magnetospheric Cusps," Instituto di Fisica dello Spazio Interplanetario (Frescati, Italy, September 2000).

T. A. Fritz, "Energetic Particles and the Magnetospheric Cusps," National University of Ireland at Maynooth (Maynooth, Ireland, September 2000).

T. A. Fritz, "Energetic Particles and the Magnetospheric Cusps," University of Iowa (Iowa City, IA, October 2000).

T. A. Fritz, "Energetic Particles and the Magnetospheric Cusps," University of Michigan (AnnArbor, MI, January 2001).

T. A. Fritz, "Sabbatical Science: Energetic Particles and the Magnetospheric Cusps," Boston University Center for Space Physics seminar (April 2001).

A. Hubbard, "A Smart Acoustic Sensor," DARPA Workshop, (Telluride, CO, July 2000).

L. B. Levitin, "Distribution of Paralogs in Procaryotic Genoms," Institute for Theoretical Biology, Humbolt University (Berlin, Germany, July 2000).

L. B. Levitin, "Promoter Recognition as a Statistical Decision Problem," Humbolt University (Berlin, Germany August 2000).

L. B. Levitin, "On Distinguishablility of Quantum States," Institute of Physics, Polish Academy of Sciences (Warsaw, Poland, August 2000).

P. Basu and **T. D. C. Little**, "A Mobility Based Metric for Clustering in Mobile Ad Hoc Networks," at the 21st IEEE International Conference on Distributed Computing and Systems [Workshop on Wireless Networks and Mobile Computing 2001] (Phoenix/Mesa,AZ, April 2001).

S. Smith, J. Baumgardner, **M. Mendillo**, and J. Wilson, "Monitoring the Lunar Transient Atmosphere with an All-sky Imager," International Committee on Space Research (COSPAR) Meeting (Warsaw, Poland, July 2000).

M. Mendillo, "Celestrial Images: Antiquarian Astronomical Charts and Maps," Banquet Speaker, Ionospheric Interactions Workshop (Santa Fe, NM, November 2000).

T. F. Morse, "Lasers and Sensors," General Dynamics Corporation (Whippany, NJ, September 2000).

T. F. Morse, "High Power Fiber Lasers," Army Research Laboratory (Adelphi, MD, April 2001).

M. Misra, E. Iliopoulos, D. Doppalapudi, H. M. Ng, **T. D. Moustakas**, "Photoconductive Detectors Fabricated on GaN and AlxxGa 1-x N Films Grown by Molecular Beam Epitaxy," 6th GaN Workshop (Richmond, VA, March 2000).

M. Misra, A. Sampath, and **T. D. Moustakas**, "Vertical Transport in n-GaN Films," 6th GaN Workshop (Richmond, VA, March 2000).

T. D. Moustakas, "MBE III-V Nitrides," 11th International Conference on Molecular Beam Epitaxy (Beijing, China, September 2000).

T. D. Moustakas, "Ordering in Nitride Alloys," 2001 Lawrence Symposium on Critical Issues in Epitaxy (Arizona State University, January 2001).

T. D. Moustakas, Series of lectures "Optoelectronic Material and Devices," Graduate Program, University of Thessaloniki (Greece, May 2001).

B. E. A. Saleh, A. F. Abouraddy, **A. V. Sergienko**, and **M. C. Teich**, "Experimental Demonstration of the Complementarity of One-particle and Two-Particle Interference," Invited Lecture, Fifth International Conference on Quantum Communication, Measurement & Computing (Capri, Italy July 2000).

B. E. A. Saleh, "Quantum Remote Sensing and Imaging," Center for Space Physics, Boston Univeristy (March 2001).

B. E. A. Saleh, "Quantum Imaging and Metrology," Naval Undersea Warfare Center, Science and Technology Distinguished Lecture (March 2001).

B. E. A. Saleh, "Do We Need New Departments of Photonics Engineering," Convocation of The Fitzpatrick Center, Pratt School of Engineering, Duke University (April 2001).

B. E. A. Saleh, "Quantum Imaging," Quantim Conference, Institut Henri Poincaré, Paris (May 2001).

E. F. Schubert, "Photon-recycling Semiconductor Light-emitting Diode," an interview on "Here and Now" with Robin Young, National Public Radio (NPR) (taped August 2000).

E. F. Schubert, J. W. Graff, Y.-L. Li, E. L. Waldron and A. Osinsky, "Polarization Effects, Acceptor Activation, and Ohmic Contacts in p-type GaN and AlGaN / GaN Superlattices," ONR Workshop on Polarization Effects in III - Nitrides (Kalispell, MO, August 2000).

E. F. Schubert, "Novel Concepts for High-efficiency White-light LEDs," OIDA Workshop and Roadmap Panel on "LED and VCSEL Solid State Lighting" (Albuquerque, NM, October 2000).

E. F. Schubert, "GaN Materials for High-efficiency Light Emitters," National Central University (Chung-Li, Taiwan, R.O.C., December 2000).

E. F. Schubert, "Novel Concepts for High-efficiency White-light LEDs," National Chiao Tung University (Hsin Chu, Taiwan, R.O.C., December 2000).

E. F. Schubert, "Novel Concepts for High-efficiency White-light LEDs," National Taiwan University (Taipei, Taiwan R.O.C., December 2000).

E. F. Schubert, "Light Emitting Diodes," National Sun Yat-Sen University (Kaohsiung, Taiwan, R.O.C., December 2000).

E. F. Schubert, "Novel Concepts for High-efficiency White-light LEDs," National Cheng Kung University (Tainan, Taiwan, R.O.C., December 2000).

E. F. Schubert, "Light Emitting Diodes for Illumination Applications," Interview broadcast on WB56, Boston Television Station, 11PM (December 2000).

E. F. Schubert, "GaN materials for high-efficiency light emitters," University of Central Florida (Orlando, FL, February 2001).

E. F. Schubert, "GaN Materials and Device Issues for High-Efficiency Light Emitting Diodes," National Research Council (Ottawa, Canada, March 2001).

E. F. Schubert, "GaN Materials and Device Issues for High-Efficiency Light Emitting Diodes," Yale University (New Haven, CT, May 2001).

A. V. Sergienko, "Entangled Photons: From Basic Physics to Quantum Engineering," Colloquium, Physics Department, University of Connecticut (Storrs, CT, February 2001).

A. V. Sergienko, "Quantum Engineering and Metrology with Entangled Photons," Special seminar National Institute of Standards and Technology (NIST) (Boulder, CO, October 2000).

A. V. Sergienko, "Quantum Metrology and Nondemolition Measurement," Lecture set at 'Enrico Fermi' Summer School "Recent Advances in Metrology and Fundamental Constants," (Varenna, Italy, July - August 2000).

A. V. Sergienko, "Engineering Entangled-Photon Sates Using Spontaneous Parametric Down Conversion," Special Seminar at Karl Zeiss (Jena, Germany, July 2000).

A. V. Sergienko, M. Atatüre, **B. E. A. Saleh**, and **M. C. Teich**, "Non-Additivity of Entanglement in Cascaded-Crystal Spontaneous Parametric Down-Conversion," 5th International

Conference on Quantum Communication, Measurement & Computing (Capri, Italy, July 2000).

A. V. Sergienko, M. Atatüre, **B. E. A. Saleh**, and **M. C. Teich**, "Engineering Space-Time Entanglement," 31st Annual Conference Physics of Quantum Electronics (Snowbird, UT, January 2001).

A. V. Sergienko, M. Atatüre, G. Di Giuseppe, M. D. Shaw, **B. E. A. Saleh**, and **M. C. Teich**, "Hyperentanglement in Parametric Down-Conversion," Invited Lecture, Quantum Interference and Cryptographic Keys: Novel Physics and Advancing Technologies International Conference (Cargese, Corsica, France, April 2001).

M. Atatüre, G. Di Giuseppe, M. D. Shaw, **A. V. Sergienko**, **B. E. A. Saleh**, and **M. C. Teich**, "Hyperentanglement in Parametric Down-Conversion," 7th International Conference on Squeezed States and Uncertainty Relations (Boston, MA, June 2001).

Z. Walton, **A. V. Sergienko**, M. Atatüre, **B. E. A. Saleh**, and **M. C. Teich**, "Performance of Photon-Pair Quantum Key Distribution Systems," 7th International Conference on Squeezed States and Uncertainty Relations (Boston, MA, June 2001).

A. V. Sergienko, M. Atatüre, G. Di Giuseppe, M. D. Shaw, **B. E. A. Saleh**, and **M. C. Teich**, "Hyperentanglement in Parametric Down-Conversion," 7th Rochester Conference on Coherence and Quantum Optics (Rochester, NY, June 2001).

A. F. Abouraddy, **A. V. Sergienko**, **B. E. A. Saleh**, and **M. C. Teich**, "Role of Entanglement in Two-Photon Imaging," 7th International Conference on Squeezed States and Uncertainty Relations (Boston, MA, June 2001).

D. Starobinski, "Probabilistic Methods for Web Caching," Computer Science Department Colloquium, Boston University (October 2000).

D. Starobinski, "Probabilistic Methods for Web Caching," Symposium on Advanced Performance Methods (SAPM 2000) (Orlando, FL, November 2000).

D. Starobinski and M. Sidi, "Modeling and Analysis of Power-Tail Distributions via Classical Teletraffic Methods," The United Technologies Sponsored Seminar Series in Manufacturing and Systems Engineering (Boston University, March 2001).

A. K. Swan, "Self-Interference Fluorescent Emission Microscopy," University of Massachusetts (Boston, MA, April 2001).

A. K. Swan, "High Vertical Resolution Spectral Self-Interference Fluorescence Microscopy," New England Society for Microscopy (Boston, MA, April 2001).

A. K. Swan, "Using Self Interference Fluorescent Emission Spectroscopy for precise vertical height discrimination," Massachusetts Institute of Technology (June 2001).

A. K. Swan, "Spectral Self-Interference Fluorescent Emission Microscopy," Photonics Seminar, Boston University (December 2000).

A. K. Swan, "Utilizing Spectral Self-Interference in Fluorescence Microscopy," Marine Biology Laboratory (Woods Hole, MA, January 2001).

M. C. Teich, M. C. Booth, **A. V. Sergienko**, and **B. E. A. Saleh**, "Entangled-Photon Photoemission," 5th International Conference on Quantum Communication, Measurement & Computing (Capri, Italy, July 2000).

M. C. Teich, "Entangled-Photon Photoemission," Electrical Engineering & Computer Science/Research Laboratory of Electronics Seminar Series on Optics and Quantum Electronics, MIT (Cambridge, MA, December 2000).

M. C. Teich, "Entangled-Photon Absorption," Joint Atomic Physics Seminar, Department of Physics and Institute for Theoretical Atomic and Molecular Physics (ITAMP), Harvard University (Cambridge, MA, March 2001).

M. C. Teich, "Information Transmission in Biological Vision," Robotics Laboratory Seminar, Harvard University (Cambridge, MA, April 2001).

M. C. Teich, "Overview of Research at Boston University's Quantum Imaging Laboratory," QUANTIM Conference, Laboratoire Kastler-Brossel, Université de Paris Pierre et Marie Curie (Paris, France, May 2001).

T. Toffoli, "All Roads Lead to Rome: Optimization Myths and Sound Strategies in Information Assurance," Workshop on "Characterizing The Macroscopic Phenomena of Complex Information Systems" (Arlington, VA, August 2000).

Ari Trachtenberg, "Efficient Reconciliation of Distributed Data Sets: ESP for Beginners," Complexity Theory Seminar, Computer Science Department, Boston University (September 2001).

Ari Trachtenberg, "Practical ESP: The Set Reconciliation Problem," Computer Science Department, Boston University (February 2001).

M. S. Ünlü, Departmental Seminar, ECE Department, University of Illinois at Urbana-Champaign (April 2001).

M. S. Ünlü, "Near-field Spectroscopy of Guided and Propagating Waves," University of California, Los Angeles (March 2001).

M. S. Ünlü, "Waveguide Biosensors," Sandia National Laboratory (Albuquerque, NM, March 2001).

M. S. Ünlü, "Photonics Research at Boston University: From Photodetectors to Microscopy," IEEE AP/MTT/ED Seminar at ECE Department, Bilkent University (Ankara, Turkey, January 2001).

M. S. Ünlü, "High-speed Resonant Cavity Enhanced Photodetectors for Optical Communications," JDS Uniphase, Epitaxx (West Trenton, NJ, November 2000).

M. S. Ünlü, "High-speed Resonant Cavity Enhanced Photodetectors for Optical Communications," Lucent Technologies, Optoelectronics Center(Breinigsville, PA, November 2000).

M. S. Ünlü, "Near-field Scanning Optical Microscopy and Spectroscopy: Instrumentation andApplications," ENSOMA Workshop (Castle Reisensburg, Germany, November 2000).

Technical Reports & Other Publications

N. Afanasyeva and **I. Bigio**, "Fiberoptic Vibrational Spectroscopy for Numerous Biomedical, Environmental, and Industrial Applications," Dept. of Physics, University of Nevada/Reno (March 2001).

C. G. Cassandras, "From Programmable Logic Control to Discrete Event Systems," *NSF Workshop on Logic Control for Manufacturing Systems* (June 2000).

C. G. Cassandras, "Discrete Event Simulation," *Intl. Workshop on Formal Methods for PerformanceAnalysis* (July 2000).

K. Gokbayrak and **C. G. Cassandras**, "The 'Surrogate Problem' Methodology for Discrete Stochastic Optimization Problems," *Dept. of Manufacturing Engineering Technical Report*, Boston University (July 2000).

A. Ajuneja and **C. Espy-Wilson**, "An Acoustic-Phonetic Approach to Speech Recognition based on Event Detection and Linear Discriminant Analysis," *141st meeting of the Acoustical Society of America* (Chicago, IL, June 2001).

O. Deshmukh and **C. Espy-Wilson**, "Robust Speech Event Detection Using Strictly Temporal Information," *141st meeting of the Acoustical Society ofAmerica* (Chicago, IL, June 2001).

S. Boyce and **C. Espy-Wilson**, "Similarities in Acoustic Modeling for /r/ and /l/," *141st meeting of the Acoustical Society ofAmerica* (Chicago, IL, June 2001).

P. Basu and **T. D. C. Little**, "Pricing Considerations in Video-on-Demand Systems," *ACM Multimedia 2000* (Los Angeles, CA, November 2000).

S. Ray and **M. Ruane**, "Fourier Analysis of a Non-uniformly Sampled Signal," Annual Meeting, New England Section ofASEE (Bristol, RI, April 2001).

K. Nelson, O. Lopez, and **M. Ruane**, "Effect of Partial Crystallization in AgInSbTe on Forming Amorphous Marks," *ODS 2001* (Santa Fe, NM, April 2001).

A. K. Swan, **M. S. Ünlü**, Y. Tong, **B. B. Goldberg**, L. Moiseev, and C. Cantor, "Self-Interference Fluorescent Emission Microscopy - 5nm Vertical Resolution," *CLEO/QUELS Meeting* (Baltimore, MD 2001).

T. Toffoli, "Amount of Computation,Action, and on the Combinatorial Origin of the Least-action Principle," invited by Physics Dept., Cognitive Science, and ECE Scientists (May 2001).

5.3 Research Labs

Advanced Electronic Materials & Device Processing Research Laboratory

This laboratory is primarily concerned with the science of electronic materials processing and the effect of such processing on device characteristics. Devices of interests include: high temperature, high frequency and/or high power switching devices and photonic devices. Research activities include: 1) investigation of high density plasma-based processes including etching, passivation, implantation, and growth; 2) application of photolithographic and high density plasma processing techniques to realize novel devices; and 3) characterization of such devices. This group works in close collaboration with Prof. Theodore Moustakas in the area of materials growth and device application and Prof. Enrico Bellotti in the area of device modeling. *Eddy*

Applied Electromagnetics Laboratory

Work focuses on experimental problems in electromagnetics with emphasis on industrial processes, sensing and measurement, and micro-electromechanical systems (MEMS). Applications include MEMS sensors and activators for adaptive optics, microvalue arrays, and bio-mems' of electrostatics materials and ESD protection. *Horenstein*

Biological Information Processing Laboratory

Work carried out in this laboratory is principally concerned with the wavelet analysis of biological signals. Particular examples include the analysis of fractal behavior of neural spike trains in hearing and vision; the analysis of the human heart rate and the differentiation of pathological from normal heart rhythms; and information transmission in biological sensory systems. *Teich*

Broadband Wireless Communications Laboratory

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

Computational Electromagnetics Laboratory

This laboratory is devoted to the application of high performance computing and advanced mathematics to the solution of problems in engineering electromagnetics. Algorithmic issues in the calculation of three-dimensional electromagnetic fields are investigated and new methods for finite-element modeling are pursued. Applications range from magnetic materials to biological systems. *Brower, Giles, Eisenberg, and Kotiuga*

Imaging Science Laboratory (ISL)

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

Integrated Circuit Fabrication Laboratory

This lab contains basic equipment for silicon integrated circuit fabrication. Research efforts are aimed at investigating fabrication processes and fabricating innovative device structures. *Smits*

Integrated DSP Environments and Architectures Laboratory (IDEA)

This laboratory conducts research in digital signal processing and its integration into application systems. Issues of interest include DSP algorithms, knowledge-based systems, software architectures for integrated DSP, software environments for the development of integrated DSP systems, integration of numeric and symbolic processing, statistical signal processing, and multidimensional signal processing. This research is carried out in the context of many applications, ranging from the interpretation of musical signals to the analysis of spread spectrum signals and the knowledge-based decomposition of electromyographic (EMG) signals. *Nawab*

Lightwave Technology Laboratory

This lab 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 and planar waveguides, high power optical fiber lasers, and a variety of optical fiber sensors. The components of this facility consist of a fabrication laboratory with three glass lathes including a new state-of-the-art Nextrom MCVD system, an optical laboratory with numerous pump lasers for fiber lasers, five isolation tables, and an 8m optical fiber draw tower, newly outfitted with Nextrom widing and control equipment. In addition, there is a CVD laboratory for studies of thin films. *Morse*

Magnetic and Optical Devices Laboratory (MODL)

Properties and applications of magnetic and magneto-optical materials are studied using optical, electrical, and computational methods in the MODL. Recent work includes: photoresist studies for CD stamper manufacturing, deposition of magnetic films on patterned substrates, investigation of X-Ray mirror materials, 3-D computational studies of GMR memory devices and eddy current losses in thin films, and development of extremely low cost, low-density optical disks and players. *Ruane, Humphrey*

Microprocessor Laboratory

In this lab, techniques for the rapid development, testing, and performance evaluation of microprocessor-based systems, including communication systems, are developed. *Perreault*

Multi-Dimensional Signal Processing (MDSP) Laboratory

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

Multimedia Communications Laboratory

The focus of this laboratory is the enabling technology for multimedia applications. Research includes investigation of distributed modes of group interaction; communication systems for continuous media; conceptual and physical database organizations; indexing schemes to support content specific queries and fast browsing; user interfaces; and applications. The laboratory is equipped with tools for real-time digital video capture, storage, conversion and playback. *Little*

Near-Field Spectroscopy Laboratory

Near-Field Microscopy/Spectroscopy is being developed as a new technique to extend the resolution of optical imaging beyond the diffraction limit, bringing a new level of optical characterization. Near-field optical microscopy has application to many areas of materials and device development, and this laboratory will serve as a resource for researchers throughout Boston University as well as industry partners. Emphasis is currently placed on the optical characterization of semiconductor devices and biological materials. In particular, this includes imaging laser diode emission and material-defect and compositional analysis for semiconductor applications. *Goldberg, Ünlü*

Picosecond Spectroscopy Laboratory (PSL)

This state-of-the-art optical characterization facility was recently established. The Picosecond Spectroscopy Laboratory provides excitation sources, spectrometers, and microwave electronic test equipment for the investigation of the linear and non-linear optical properties of materials and devices. The research emphasis in this laboratory is on high-speed photodetectors, particularly time-resolved characterization of photodiodes. *Ünlü*

Quantum Imaging Laboratory

Research in the Quantum Imaging Laboratory focuses on photonic imaging systems that make use of the special properties of nonclassical light. Experiments are conducted on nonlinear optical parametric down-conversion; quantum coherence; quantum imaging; quantum interferometry and microscopy; and quantum communications and cryptography. *Saleh, Sergienko, Teich*

Radio Communications and Plasma Research Laboratories

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

Reliable Computing Laboratory

Members of the Reliable Computing Laboratory conduct research on a broad variety of topics, including the design of computer chips; efficient hardware testing at the chip, board, and system levels; functional software testing; efficient signal processing algorithms; coding and decoding; fault-tolerant message routing for multiprocessor systems; and the design of reliable computer networks. *Karpovsky, Levitin, and Roziner*

Semiconductor Device Research Laboratory

This laboratory fabricates prototypes of next-generation optoelectronic devices such as semiconductor lasers and light-emitting diodes. Activities include photolithographic fabrication, optical and electrical characterization, and modeling of device and systems properties. *Schubert*

Sensors, Actuators, and Micromechanics Laboratory

Clean-room fabrication facilities in this lab are used to develop silicon sensors and actuators with integrated electronics. Silicon machining and piezoelectric sensor materials are integrated to create tactile sensors, strain gauges, optical scanners for helmet mounted displays or optical disk drives, micropumps for drug delivery and for gas pumps to be used in gas chromatographs for flights to Mars, and autonomous mobile "silicon ants" (micro-robots). *Smits*

Software Engineering Laboratory (SEL)

An instructional and research lab, the Software Engineering Laboratory (SEL) supports courses and research on the economical design of reliable software for large-scale and embedded computer-based systems. The lab is comprised of more than twenty-five Silicon Graphics and Gateway 2000 networked workstations, plus four Motorola embedded computer development systems. The SEL provides students with state-of-the-art development tools for the design, implementation, and testing of significant software systems. *Vidale*

Speech Communication Laboratory

The Speech Communication Laboratory is concerned with understanding human speech communication, including speech production, speech perception, and lexcial access. This knowledge is incorporated into the development of technologies for automatic speech recognition, speech enhancement and speech aids. SCL is equipped with several workstations with audio recording capability, playback facilities and software for data analysis and algorithm development. *Espy-Wilson*

VLSI and Neural Networks Systems (VNNS) Laboratory

The VNNS group designs, builds, and tests innovative architectures that span a wide variety of VLSI applications in electrical and biological fields. Chips designed using digital, analog, and subthreshold methodologies are realized using CMOS BiCMOS and Bipolar technologies. Applications include 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. *Hubbard*

Wide Band Gap Semiconductors Laboratory

In this laboratory, we investigate the growth, optoelectronic properties and device applications of III-Nitride semiconductors. The materials are grown by Molecular Beam Epitaxy (MBE), Vapor Phase Epitaxy (VPE) and Ion-Beam Cluster Deposition (IBCD). Device applications include blue-UV VCSELs, optical modulators, UV solar-blind detectors, transistors and MEMS. The laboratory is equipped with clean room facilities for materials growth (MBE, VPE and IBCD) and device fabrication (electron beam evaporator and sputtering units) as well as facilities for material and device characterization. This group collaborates closely with Professor Charles Eddy in the area of device processing and with Professor Enrico Bellotti in the area of device modeling. *Moustakas*

5.4 Centers and Interdisciplinary Activities

Center for Computational Science (CCS)
http://satchmo.bu.edu/

The CCS at Boston University was chartered in 1989 as an interdisciplinary focal point for computational science research and education. In collaboration with the Office of Information Technology's Scientific Computing and Visualization Group (SCV), CCS has made leading edge computational resources available to researchers and students on a university wide basis since the installation of its first massively parallel supercomputer in 1988. The recent installation of the SGI/Cray Origin2000 represents the fourth generation parallel supercomputing technology at the University. Facilities also include an SGI Power Challenge Array, advanced graphics workstations, virtual reality stations and very high speed networking.

The University's support of computational research has been extended to institutions throughout New England by means of the NSF funded MARINER (http://mariner.bu.edu/) project, a collaboration between CCS and SCV. MARINER offers education and training programs, access to state-of-the-art computing facilities and opportunities for pilot projects, Internet connectivity and industrial partnerships.

The Center is a cooperative venture in which associated members come from a variety of disciplines in the academic and industrial communities to develop and take advantage of leading-edge computer and communications technologies. Under the auspices of MARINER, CCS takes its place as a leader in developing computational applications in collaboration with regional schools and companies.

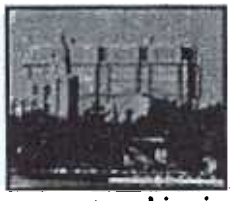
Building on MARINER, the University is extending its programs on a national scale as a partner in the National Computational Science Alliance, one of two national Partnerships for Advanced Computational Infrastructure supported by the NSF.

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 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 nearly 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 $80 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, Precison 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.

Center for Subsurface Sensing and Imaging Systems (CenSSIS)

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

The Center for Subsurface Sensing and Imaging Systems (CenSSIS) is a National Science Foundation Engineering Research Center (ERC) established in 2000. 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 collaborative effort of 4 academic institutions: Northeastern University, Boston University, Rensselaer Polytechnic Institute, and the University of Puerto Rico at Mayagüez; and 4 strategic affiliates: Massachusetts General Hospital, Brigham and Women's Hospital, 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.

5.5 New Grants and Contracts

The table on the next four pages delineates the new grants awarded over the 2000/01 fiscalyear. The funding level for new grants, where an ECE faculty member is the Principal Investigator (PI), is approximately $6,351k. ECE faculty members were also Co-PI's on grants with PI's from other departments, as noted in the table. Their share of the funding for new grants awarded is approximately $662k. The total of new grants is therefore approximately $7.013M. In addition, ECE faculty have received gifts and other awards totaling $213k, as noted in Section 5.7.

New Grants with ECE Principal Investigators

FACULTY	TITLE OF AWARD	SOURCE	BEGIN	END	AMOUNT
Bellotti, Enrico Eddy, Charles (Co-PI) Moustakas, Theodore (Co-PI)	Feasibility Study of GaN-Based Permeable Base Transistors (PBTs)	BAE Systems	05/31/01	12/01/01	$13,396 (PI) $13,396 (Co-PI) $13,395 (Co-PI)
Brackett, John	A Language and an Authoring Tool for the Creation of Clinical Guidelines	HHS/NIH/NLM	07/01/00	12/31/00	$12,207
Carruthers, Jeffrey	CAREER: High Bit Rate Wireless Infrared Communications	NSF	04/01/99	03/31/03	$10,000
Castañon, David	MURI95: a comprehensive and integrated approach to reduced signature target recognition	DOD/Air Force	12/01/00	01/31/01	$202,000
Castañon, David	Center for Subsurface Sensing and Imaging Systems (CenSSIS)	NSF	07/01/00	08/31/01	$89,450
Castañon, David	Cooperative Control in Adversarial Environments	DOD/Air Force	06/01/01	11/30/01	$103,459
Eddy, Charles	Processing of High-Performance UV Detector Arrays	DOD/DARPA	06/01/00	12/30/00	$15,000
Eddy, Charles	Fabrication of Ultraviolet P-I-N GaN and AlGaN Photodiode Detector Arrays	DOE	02/15/01	05/31/02	$20,000
Eddy, Charles	Processing of Advanced Recessed-Gate GaN HEMT Technology	DOD/Navy	02/09/01	09/30/01	$15,000
Eddy, Charles	Processing of High Performance UV Detector Arrays	DOD/DARPA	06/01/00	08/31/01	$37,000
Espy-Wilson, Carol	Studies of Speech Communication	HHS/NIH/NIDCD	06/01/01	05/31/02	$66,636
Espy-Wilson, Carol	Tides Portal Support	DOD/SPAWAR	07/01/00	03/31/01	$6,143
Espy-Wilson, Carol	Tides IFE Arabic Project (N. Franzen) (BBNT Solutions LLC)	DOD	04/01/01	06/30/01	$6,143
Hubbard, Allyn	A Biomimetic Smart Acoustic Sensor (in conjunction with Hearing Research Center)	DOD/Navy	06/08/00	07/31/03	$1,300,000
Hubbard, Allyn	A Biomimetic Smart Acoustic Sensor (in conjunction with Hearing Research Center)	DOD/Navy	06/08/00	07/30/02	$200,000

FACULTY	TITLE OF AWARD	SOURCE	BEGIN	END	AMOUNT
Hubbard, Allyn	A Biomimetic Smart Acoustic Sensor (in conjunction with Hearing Research Center)	DOD/Navy	06/08/00	07/31/03	$700,000
Karl, W. Clement	Anatomic Morphologic Analysis of MR Brain Images (Subcontract via Massachusetts General Hospital)	HHS/NIH/NINDS	09/01/00	08/31/01	$77,555
Little, Thomas	Rapid Task-Based Self-Organization in Distributed Ad-hoc Spaces	NSF	09/01/00	08/31/03	$301,620
Morse, Theodore	DURIP: Request for an Optical Fiber MCVD Deposition System and Computer Controlled Glass Lathe	DOD/Air Force	01/01/00	12/31/00	$150,000
Morse, Theodore	Novel Designs for High Power Thulium Fiber Lasers	Sanders/Lockheed	07/13/00	07/12/01	$49,000
Morse, Theodore	Photonics Technology Development and Insertion/Task 1: Fiber Laser Technology	DOD/Army	09/21/00	09/20/01	$103,438
Morse, Theodore	Advances in Fiber Lasers	DOD/Air Force	01/01/01	09/30/01	$172,500
Moustakas, Theodore	GCIB GaN Growth	DOD/BMDO/DTRA	08/05/00	04/05/02	$120,000
Moustakas, Theodore	Investigation of Piezoelectric III-Nitride Films Grown on Silicon Carbide Micromachined Devices	Boston Microsystems	09/01/00	05/30/01	$25,830
Moustakas, Theodore	Investigation of Atomic Long-Range Order in AlGaN Films	DOD/ Navy	12/01/00	09/30/02	$93,007
Moustakas, Theodore	Photonics Technology Development and Insertion/Task 5: Gallim Nitride Modulator Technology	DOD/Army	09/21/00	09/20/01	$128,763
Moustakas, Theodore	Photonics Technology Development and Insertion/Task 6: Gallim Nitride Vertical Cavity Surface-Emitting Lasers (GaN VCSEL) Technology	DOD/Army	09/21/00	09/20/01	$75,859
Moustakas, Theodore	III-V Nitride UV Detector Arrays Fabricated by Combining HVPE Lateral Epitaxial Overgrowth and MBE Methods	DOD/Navy	01/01/99	12/31/01	$75,000

FACULTY	TITLE OF AWARD	SOURCE	BEGIN	END	AMOUNT
Moustakas, Theodore	Integrated Device Cooling Based on Hot Electron Emission (subcontract via Astralux, Inc.)	DOD/DARPA	03/06/01	06/30/01	$30,000
Moustakas, Theodore	Optoelectronic Neural System	NASA	03/06/01	06/30/01	$20,000
Nguyen, Truong	Image Compression for Unmanned Underwater Vehicles	DOD/Navy	12/14/00	12/31/01	$65,000
Oliver, William	Upper Atmosphere/Ionosphere Studies	NSF	08/15/00	07/31/01	$97,530
Oliver, William	Upper Atmosphere/Ionosphere Studies	NSF	08/01/01	07/31/02	$101,430
Oliver, William	Tides Portal Support	DOD/SPAWAR	07/01/00	12/31/00	$12,129
Perreault, David	Communication reduction study	P&E Microcomputer Systems	01/01/01	12/31/01	$34,964
Ruane, Michael	Center for Subsurface Sensing and Imaging Systems (CenSSIS)	NSF	07/01/00	08/31/01	$62,359
Saleh, Bahaa	Center for Subsurface Sensing and Imaging Systems (CenSSIS)	NSF	07/01/00	08/31/01	$121,402
Saleh, Bahaa Teich, Malvin (Co-PI) Sergienko, Alexander (Co-PI)	Quantum Remote Sensing	DOD/NRO	02/05/01	10/31/01	$58,334 (PI) $58,333 (Co-PI) $58,333 (Co-PI)
Schubert, E. Fredrick	Enhancement of Deep Acceptor Activation in Semiconductors by Superlattice Doping	DOD/Navy	12/01/98	12/30/01	$111,859
Schubert, E. Fredrick	Novel Ohmic Contact Technology	NSF	09/01/00	08/31/03	$240,000
Sergienko, Alexander Teich, Malvin (Co-PI) Saleh, Bahaa (Co-PI)	Quantum Ellipsometry	NSF	10/01/00	09/30/01	$26,667 (PI) $26,667 (Co-PI) $26,666 (Co-PI)
Sergienko, Alexander Teich, Malvin (Co-PI) Saleh, Bahaa (Co-PI)	Quantum Cryptography with Polarized Entangled Photons	DOD/Air Force	09/01/00	05/31/01	$7,064 (PI) $7,063 (Co-PI) $7,063 (Co-PI)
Suri, Neeraj	CAREER Program: USER/OS Transparent Fault Recovery Using Caches	NSF	05/04/01	05/31/02	$50,000
Teich, Malvin Saleh, Bahaa (Co-PI)	XYZ on a chip: Development and Fabrication of Three-Dimensional Microdevices	NSF	09/01/00	08/31/01	$94,455 (PI) $94,455 (Co-PI)

FACULTY	TITLE OF AWARD	SOURCE	BEGIN	END	AMOUNT
Teich, Malvin Saleh, Bahaa (Co-PI) Sergienko, Alexander (Co-PI)	**Entangled-Photon Absorption and Spectroscopy**	**NSF**	**06/01/01**	**05/31/02**	**$43,334 (PI) $43,333 (Co-PI) $43,333 (Co-PI)**
Toffoli, Tommaso	**Programmable Matter Methods**	**DOE**	**09/01/00**	**08/31/01**	**$110,576**
Ünlü, Selim Goldberg, Bennett (Co-PI) Lutchen, Kenneth (Co-PI)	**Development and Study of Hyper-Polarized Noble Gas System**	**NSF**	**09/01/00**	**08/31/01**	**$32,211 (PI) $32,210 (Co-PI) $32,210 (Co-PI)**
Ünlü, Selim	**Photonics Technology Development and Insertion/Task 2: Optical Communication and Polarization Sensing**	**DOD/Army**	**09/21/00**	**09/20/01**	**$152,046**
Ünlü, Selim Goldberg, Bennett (Co-PI)	**Monolithically Integrated Thermoelectric Coolers for Mid-IR Lasers/High Resolution Thermal Imaging**	**DOD/DARPA**	**12/01/99**	**11/30/01**	**$17,500 (PI) $17,500 (Co-PI)**
Ünlü, Selim Goldberg, Bennett (Co-PI)	Monolithically Integrated Thermoelectric Coolers for Mid-IR Lasers/High Resolution Thermal Imaging	DOD/DARPA	12/01/99	11/30/01	$109,650 (PI) $109,650 (Co-PI)
Total Awards					**$6,351,123**

New Grants with ECE Co-PI's

FACULTY	TITLE OF AWARD	SOURCE	BEGIN	END	SHARED AMNT
Giles, Roscoe (Center for Computational Science)	New Approaches to Human Capital Development Through Information Technology Research (in conjunction with ENG/ECE) (Subcontract via Northeastern Univ.) ($105,834)	NSF	09/15/00	09/14/01	$105,834
Giles, Roscoe (Center for Computational Science)	PACI: Education, Outreach and Training (EOT) (Subcontract via Univ. of Illinois) ($77,500)	NSF	10/01/99	09/30/00	$19,375
Giles, Roscoe Rebbi, Claudio Bresnahan, Glenn (Center for Computational Science)	Partnerships for Advanced Computational Infrastructure (PACI) (additional co p.I.: John Porter) (Subcontract via University of Illinois/National Center for Supercomputing Applications) ($183,900)	NSF	10/01/00	09/30/01	$45,975
Rebbi, Claudio Bresnahan, Glenn Giles, Roscoe Porter, John	PACI: MARINER/ A Mid-Level Alliance Resource in the North East Region (Subcontract via Univ. of Illinois) ($197,500)	NSF	10/01/99	09/30/00	$49,375
Rebbi, Claudio Bresnahan, Glenn Giles, Roscoe Porter, John	MARINER/ A Mid-Level Alliance Resource in the North East Region ($403,000)	NSF	10/01/00	09/30/01	$100,750
Mountain, David Hubbard, Allyn	Active Filtering in the Cochlea (in conjunction with Hearing Research Center ($242,863)	HHS/NIH/ NIDCD	07/01/00	06/30/01	$72,859
Mountain, David Hubbard, Allyn	Models of Whale Auditory Function (in conjunction with Hearing Research Center ($150,000)	Dept. of Defense/Navy	09/01/00	09/30/03	$45,000
Mountain, David Hubbard, Allyn	Active Filtering in the Cochlea (in conjunction with Hearing Research Center ($329,948)	HHS/NIH/ NIDCD	07/01/01	06/30/02	$98,984
DuLuca, Carla Nawab, Hamid	Harnessing MotoNeuron Activity from Lab to Clinic (in conjunction with Neuromuscular Research Center) ($604,881)	NIH	06/01/01	05/31/02	$92,809
Goldberg, Bennett Ünlü, Selim (Physics)	SBIR Phase II: An Ultra-Sensitive Optical Biosensor for Food Safety (inconjunction with Photonics Center) (Subcontract via SatCon Technology Corp.) ($62,349)	Dept. of Defense/Army	01/02/01	12/31/01	$31,175
SUBTOTAL	Grants with ECE Co-PI's				$662,136
GRAND TOTAL					**$7,013,259**

5.6 Continuing Grants and Contracts

The following table delineates grants in which research has continued during 2000/2001.

FACULTY	TITLE OF AWARD	SOURCE	BEGIN	END
Carruthers	CAREER: High Bit Rate Wireless Infrared Communications	NSF	04/01/99	03/31/03
Castañon Karl	Sensor Management and Information Fusion for Detection, Localization and Classification of Mines (Subcontract via Northeastern Univ.)	DOD/Army	12/01/99	01/31/01
Espy-Wilson	Device for enhancing artifical-larynx speech	S.T.A.R. corp.	06/01/98	12/31/00
Espy-Wilson	Knowledge-Based Speech Signal Representation	NSF	07/01/98	06/30/01
Hubbard	Design, construction and testing of a rotary device for automated drug and chemical analysis	Alexion Pharmaceuticals, Inc.	04/01/98	03/31/01
Hubbard	A MURI Center for Automated Vision and Sensing Systems	Office of Naval Research	06/01/98	08/31/01
Little	Dynamic Service Aggregation for Interactive Information Delivery	NSF	09/01/98	08/31/00
Karpovsky	REU Supplement: Software Implemented Fault Tolerance in Multiprocessors	NSF	01/01/97	07/31/01
Karpovsky	Software Implemented Fault Tolerance in Multiprocessors	NSF	08/01/96	07/31/01
Morse	Miniature Photoacoustic Detector for Trace Chemical and Biological Warfare Agents (in conjunction with Photonics Center	ONR	09/01/99	10/01/01
Morse	NSF STTR Phase II: A Fiber-Optic Probe for In-situ Measurement of Thin Film Deposition (in conjunction with Photonics Center) (Subcontract via Ion Optics, Inc.)	NSF	09/01/99	09/30/01
Nawab	MRI: acquisition of computer facilities to support an interdisciplinary multidata signal and image processing laboratory	NSF	09/01/98	08/31/01
Nguyen	Wavelet design for discrimination and target recognition	Brown University	05/01/98	04/30/01

FACULTY	TITLE OF AWARD	SOURCE	BEGIN	END
Nguyen	Multiresolution-Based Watermarking Algorithms	A&T Engineering Technologies Group	09/01/98	12/31/00
Nguyen	Multiresolution Analysis of Epileptic Signals	Flint Hills Scientific, L.L.C.	08/24/98	12/31/00
Saleh, Teich Sergienko	Imaging and Optical Processing with Entangled Photons	NSF	05/01/99	04/30/01
Schubert	Enhancement of Deep Acceptor Activation in Semiconductors by Superlattice Doping	NSF	08/15/97	06/30/01
Sergienko	CAREER: Quantum cryptography with entangled photons	NSF	02/15/99	01/31/03
Smits	Very large angle optical scanner	GSI Lumonics	09/01/99	08/31/01
Teich, Sergienko, Saleh	Entangled-Photon Fluorescence Microscopy	NSF	05/01/98	12/31/00
Teich, Saleh	Functional Imaging of Synapses by Entangled-Photon Microscopy	The David and Lucile Packard Foundation	08/01/99	08/31/04
Teich, Sergienko, Saleh	Entangled-photon microscopy	Acarl Zeiss Jena Gmbh	07/01/00	12/31/01
Ünlü	PRIDE: photonics research in interdisciplinary education -- REU supplement	NSF	06/01/96	12/31/01
Ünlü	CAREER: Development in Innovative Optoelectronic Devices and Optical Characterization Techniques	NSF	09/01/97	08/31/00
Ünlü	US-Turkey cooperative research: high performance photodetectors for longhaul optical communications	NSF	07/01/99	06/30/02
Ünlü	REU supplement: US-Turkey cooperative research: high performance resonant cavity enhanced photodetectors and applications	NSF	07/01/99	08/31/01
Ünlü	PRIDE: photonics research in interdisciplinary education -- participant support costs	NSF	05/31/96	12/30/01
Ünlü	Photonics Research in Interdisciplinary Education-- REU Suppliment	NSF	06/01/96	12/31/01

5.7 Gifts and Other Awards

The following table delineates gifts and other awards received during 2000/2001.

FACULTY	DONOR	AMOUNT
Sergienko, Alexander **Teich**, Malvin **Saleh**, Bahaa	California Institute for Physics andAstrophysics	$24,700
Humphrey, Floyd	Seagate Technology, Inc.	$50,000
Smits, Johannes	CTI-Cryogenics Helix Technology Corporation	$19,500
Schubert, E. Frederick	Provost Innovation Award	$25,000
Morse, Theodore	Hope Technologies, Inc.	$50,000
Morse, Theodore	Intelcore Technologies, Inc.	$44,277
Total Awards		**$213,477**

6. Outlook

The last decade has witnessed the maturation of the ECE department froma primarily undergraduate program to a more balanced department with quality instruction, a substantial research program, and an increasingly distinguished faculty. Key statistics of enrollment, degrees awarded, faculty size, and grant funding in the last 10 years are exhibited in the following tables and charts.

6-1 Enrollment

Fall enrollments in the BS, MS, and Ph.D. programs are listed inTable 6-1 and Chart 6-1. Important undergraduate trends in ECE have tended to mirror national patterns. These include:

- A demographic decline in undergraduate enrollment occurred mid-decade, followed by an increase and subsequent stabilization resulting from college restriction on enrollment, which was implemented to attain a higher quality student body.
- Enrollment shifted from EE to CSE, such that 64% of students now pursue CSE (see Chart 6-2).

	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00
BS	441	384	338	334	358	381	390	398	410	410	411
MS	281	247	201	171	135	103	68	70	83	80	67
Ph.D.	39	44	49	50	55	64	78	83	80	72	83
Total	761	675	588	555	548	548	536	551	573	562	561

Table 6-1: Enrollment

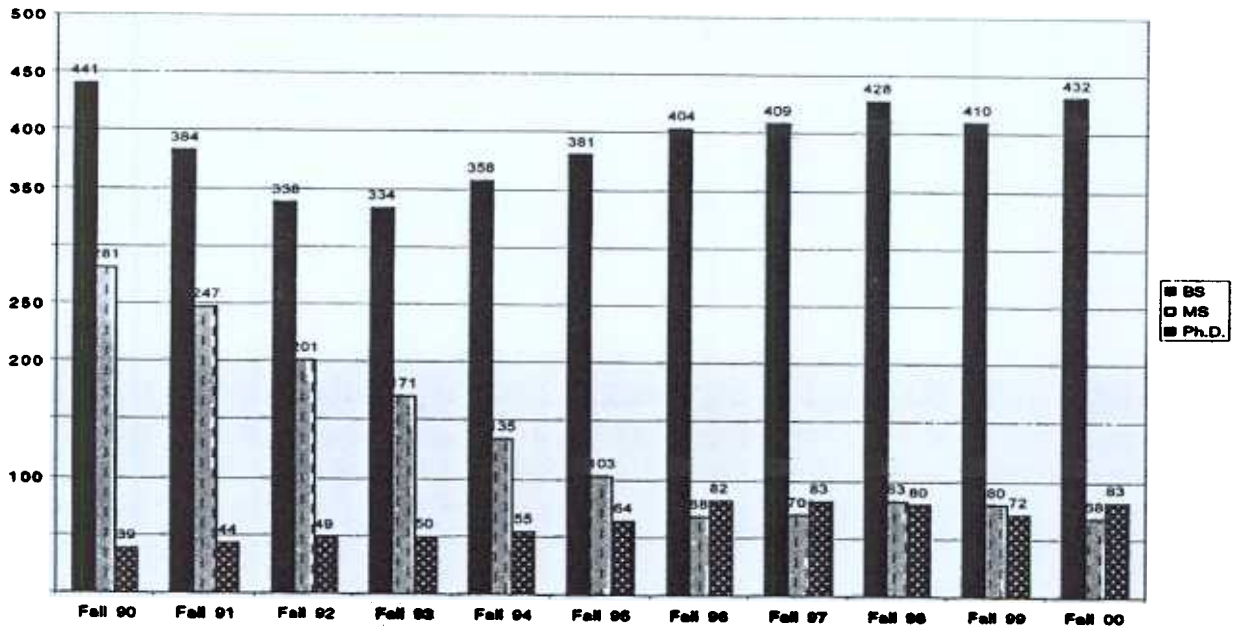


Chart 6-1: Undergraduate and Graduate Student Enrollment

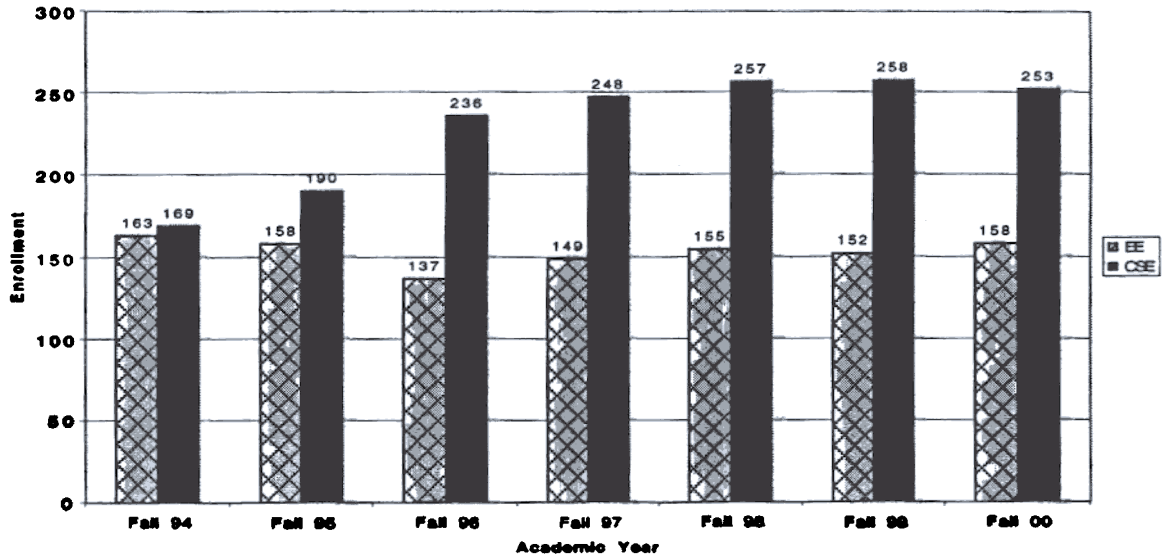


Chart 6-2: EE and CSE Enrollment in BS Program

At the graduate level, the emphasis has shifted from professional MS-oriented students to Ph.D. students:

- MS degree enrollments have been steady over the past five years, but remain much lower when compared to the 1990 to 1994 period, due to the demise of the Corporate Classroom program.
- Ph.D. enrollment has risen, along with the number of applications, but domestic candidates remain difficult to recruit.
- Graduate fellowship resources have remained fixed, while RA support grew modestly with grant funding.

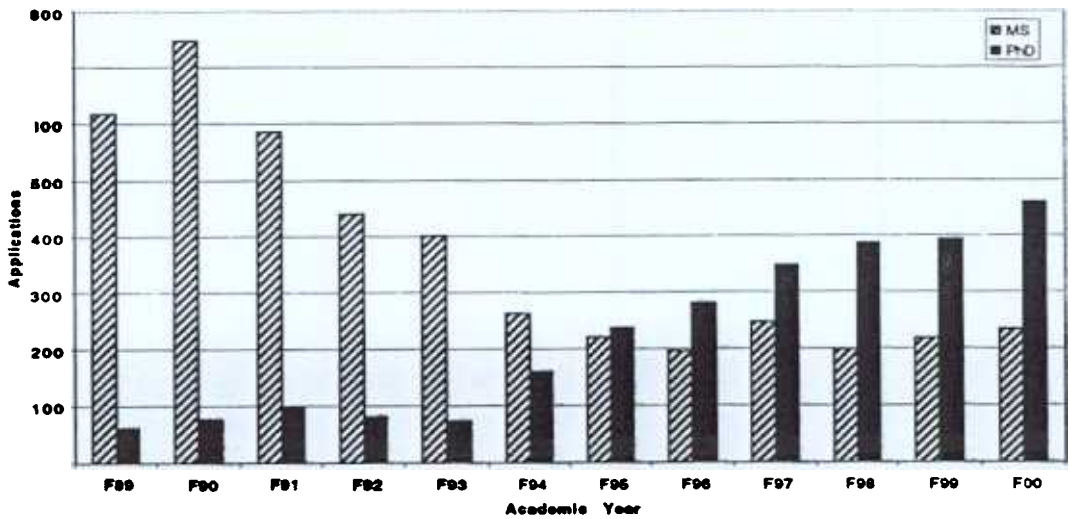


Chart 6-3: Graduate Student Applications

6.2 Degrees Granted

Data on the degrees granted by the department in the last ten years are shown inTable 6-2 and Charts 6-4 to 6-6. The number of Ph.D. degrees awarded has increased from an average of 6 per year in 1992-96, to an average of 9.4 per year, in 1997-2001.

	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01
BS	130	115	88	78	85	90	88	96	98	99	102
MS	130	136	109	91	92	70	52	28	43	38	45
Ph.D.	4	6	4	6	10	4	10	15	4	10	8
Total	264	257	201	175	187	164	150	139	145	147	155

Table 6-2: Degrees Granted

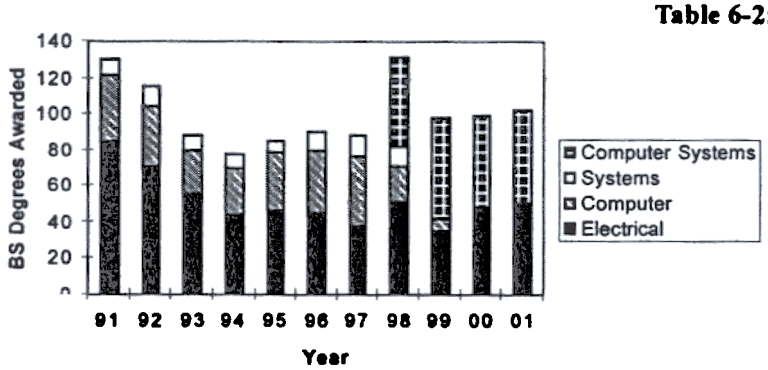


Chart 6-4: BS Degrees Awarded

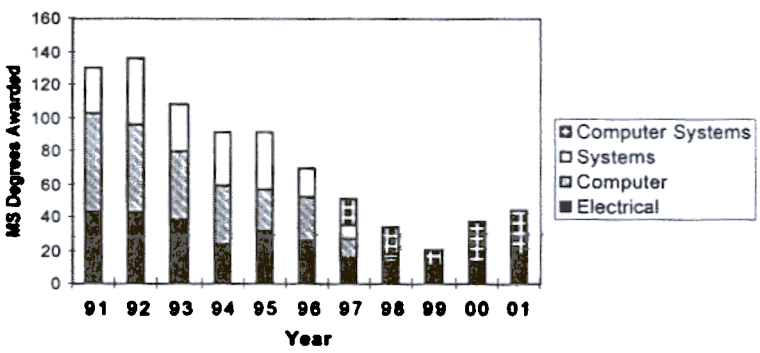


Chart 6-5: MS Degrees Awarded

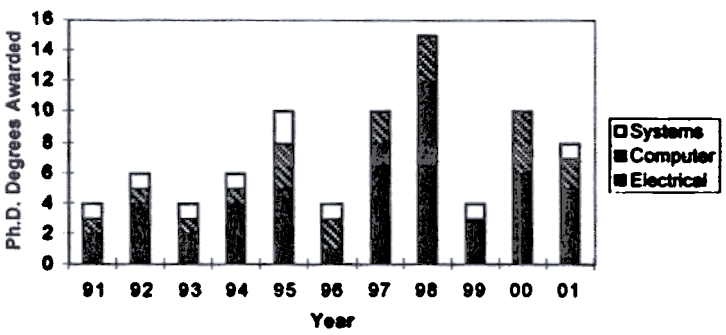


Chart 6-6: Ph.D Degrees Awarded

6.3 Research Funding

Research funding has grown significantly over the last ten years. After a year of aggressive effort, total new research funding has surpassed $6.3M for the 2001 fiscal year:

- Funding per faculty totaled approximately $177k.
- Annual average over the last six years (1996-01) is $5.1M., compared to $2.4M over the previous five years (1990-95).

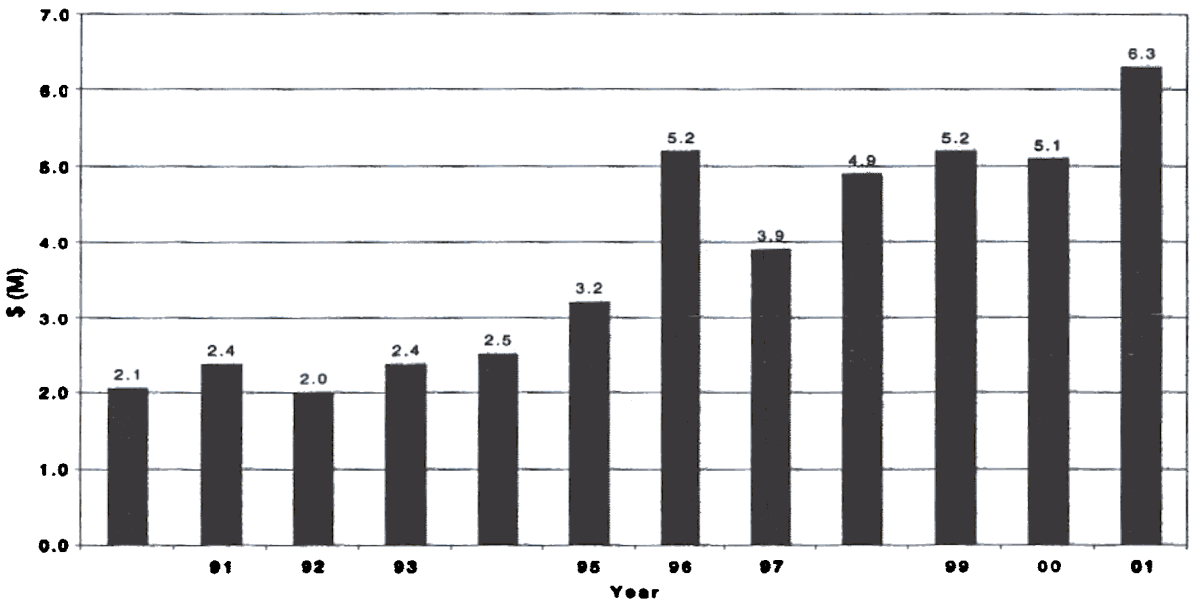


Chart 6-7: New Research Grants and Contracts These figures include only grants and contracts for which the Principal Investigators (PI) were ECE faculty The share of grants for which ECE faculty were Co-PI's totaled approximately $6.6k in 2000/01, so that the total funding is approximately $7M.

6.4 Faculty and Staff

Faculty hiring has largely replaced departures, with small net growth over the last ten years:

- Department growth has has remained at about the same level over the last five years.
- 13 of the current faculty joined the department in the last five years.
- New hires have been directed both to strategic research thrusts and to address shifting enrollments.

Staff development has lagged behind the faculty and programmatic changes:

- Scientific staff (post docs, visitors) has increased with associated space and administrative demands.
- Teaching lab staff positions have remained at 6.
- Administrative staff has grown much slower than the faculty/scientific staff head count and research volume.

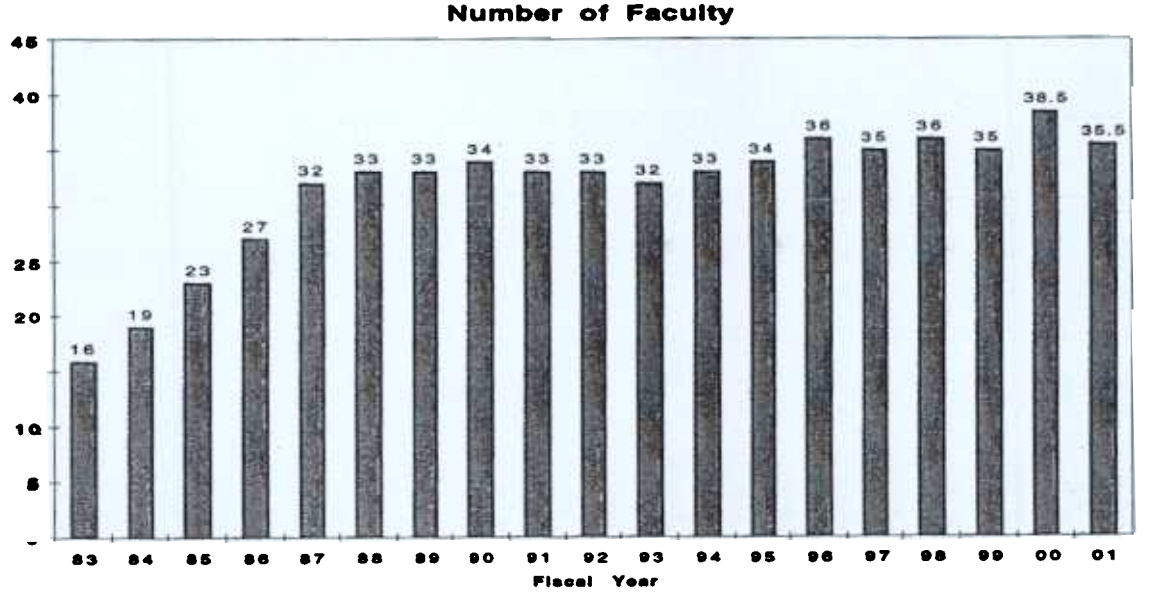


Chart 6-8: Faculty Growth and Turnover Since 1983 Affiliate faculty and research faculty with no teaching responsibilities are not included in this chart.

6.5 Targeted Growth

The ECE faculty have held extensive discussions at various meetings and annual retreats in recent years to determine strategic areas for targeted growth. Plans for faculty growth have been motivated by the need to strengthen existing research areas to make them more competitive at a national level, develop expertise in areas of ECE where important new technologies are expected to grow, and respond to shifting and growing student enrollments at both undergraduate and graduate levels. As described in Section 2, the department has three main divisions: *electrophysics* (which includes photonics, solid state materials and devices, and electromagnetics), *information systems & sciences* (which includes speech and image processing, and control and communication systems), and *computer engineering* (which includes hardware, software applications, and computer and communication networks). These areas overlap and are mutually supportive, and our planned growth aims at exploiting synergies between these areas, as well as links with other departments and centers.

The following areas have been selected for growth

Computer Systems Engineering

Our most urgent need for growth is in computer systems engineering. This is immediately dictated by increasing undergraduate enrollment, reflecting the robust market for our graduates. Enrollment in CSE has surpassed that in EE, yet the number of faculty capable of teaching computer engineering courses, particularly in software engineering is inadequate. Some teaching is done by non-research active faculty. Failure to add new faculty in this area could result in severe course staffing problems and frustrate research growth. To achieve greater national visibility, CSE must keep up with the chang-

ing face of our profession, information revolution, and play a leading role in shaping future technological advances. Recruiting in CSE is not easy under the best of circumstances. The scarcity of qualified people and the strong competition with industry and other universities means that most ECE departments in the U.S. are facing the same difficulty, and makes vigorous recruiting in computer engineering a necessity. This growth in computer systems engineering is coordinated with the BU Department of Computer Science to benefit from synergies and to enhance our competitiveness in attracting new faculty members. Stronger links with the Center for Computational Science are necessary. Another link offering particularly strong synergistic possibilities is that between the ECE High Performance Computing group and the Center for Space Physics (CSP). CSP is a BU research center with strong links to ECE (40% of its graduate students are from ECE).

Telecommunication and Computer Networks

Another area of high student demand and important research is telecommunication and computer networks. Telecommunications and networking have dramatically changed society and their economic impact will continue to grow. They drive much of the recent technology growth in computers and VLSI. The department has enhanced the curriculum at both the undergraduate and graduate levels and is increasing the size of its research effort. Computer-network specialists would also help us in meeting some of our urgent teaching needs in the general computer systems engineering program. The Computer Science Department at BU has also targeted computer networks for growth, and our combined effort can foster a strong BU effort in this very important area.

Analog and Digital VLSI Electronics

Analog and digital VLSI electronics continues to be an area of fundamental importance. VLSI circuits constitute the principal hardware for computers and embedded systems. Maintaining a strong instructional program in this area is essential for both our degree programs. The application of VLSI electronics to biological sensors is an area of great potential, and interests both the ECE and the Biomedical Engineering (BME) departments. The addition of more faculty is essential to meet increased teaching needs and to give this research area the critical mass needed to gain national recognition and competitiveness for research funds.

Photonics

When BU established the Photonics Center, it made a strategic commitment to become a national center of excellence in photonics. Senior and junior ECE faculty have been added in photonic materials and devices, quantum optics, and fiber-optic sensors. There is need to maintain the momentum and to continue to strengthen this program with new faculty. This will of course enrich the scientific base of the Photonics Center and its technical vitality. While we have outstanding research in photonic materials and devices and their applications, we lack strength in the systems area, particularly in high-speed optical communication, switching, and networks. Growth in these areas would also strengthen our effort in telecommunication and computer networks. Another area of importance in photonics and also solid state devices is micro-electromechanical systems (MEMS) and their optical applications in sensors, scanners, and actuators. MEMS is a thrust area for other engineering departments, and MEMS efforts will benefit from a well coordinated faculty recruiting campaign and a large research group in this important area. We have taken the first steps to establish a new MS degree program in photonics. A number of ECE faculty have offered successful distance learning short courses in photonics, as part of a College wide program.

Signal, Speech, and Image Processing

ECE has an outstanding, and well-funded, group of faculty in signal, speech, and image processing. This group has established an excellent reputation and enjoys an unusually strong graduate student interest. The group includes leaders of a multi-university multi-million dollar MURI AFOSR grant, and the new NSF Engineering Research Center for Subsurface Imaging and Sensing (See page 5-19). The Department is endeavoring to maintain the strength of this group and to seek opportunities to make it even stronger by enhancing its ties with other BU groups.