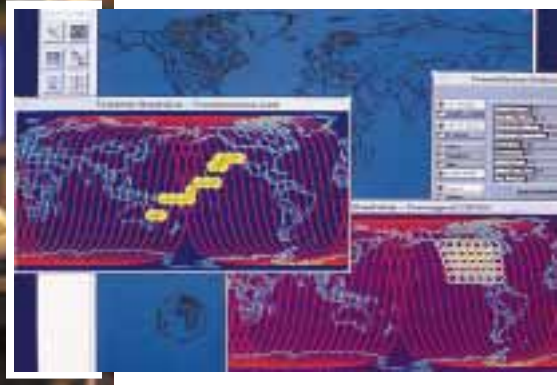
UNIVERSITY OF MARYLAND

DEPARTMENT OF

Electrical Engineering



Annual Report 1997-98

A. JAMES CLARK SCHOOL OF ENGINEERING • GLENN L. MARTIN INSTITUTE OF TECHNOLOGY

The Department of Electrical Engineering is one of the premier units in the A. James Clark School of Engineering at the University of Maryland. With 61 regular faculty members, 900 undergraduate students, 450 graduate students and $27.5 million in research expenditures, the Department is home to some of the most active, innovative and exciting education and research programs in the country.

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Publications Editors:
Eric Schurr and Nancy Swader.

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Electrical Engineering Advisory Board

The Department of Electrical Engineering's advisory board consists of representatives from industry, government laboratories, and academe. The board offers the Department expert advice on topics such as strategic planning and curriculum revision. The board meets formally once yearly, although members are actively involved with the department's activities throughout the year.

Department of Electrical Engineering Advisory Board Members

Dr. Hamid Ahmadi
Vice President, Networking and Distributed Systems Research
AT&T Laboratories Research

Mr. Farzin Arsanjani
President
HTR, Inc.

Dr. Jim Chadwick
Chief Engineer
Mitre Corporation

Dr. Timothy Coffey
Director
Naval Research Laboratory

Dr. Robert Cooper
President
Atlantic Aerospace Electronics Corp.

Dr. Lee D. Davisson
Professor Emeritus

Mr. Vito DeMonte
Principal
Booz·Allen & Hamilton Corporation

Dr. Donald H. Foley
Sector Vice-President
SAIC

Mr. Chris Gerding
Vice President for Risk Management
Citibank Corporation

Mr. Raymond W. Godman, Jr.
Vice President and General Manager
TRW Information Services Division

Mr. John Kenyon
Senior Vice President for Engineering
Hughes Network Systems

Dr. Edward J. McKinney
Technical Director, NBD - Marketing
General Dynamics Advanced Technology Systems

Dr. James M. O'Connor
Senior Member, Technical Staff
Microelectronics & Technology Center
AlliedSignal, Inc.

Dr. Panos Papamichalis
TI Fellow
Manager, Digital Communications Technology
Texas Instruments, Inc.

Mr. Timothy Ruppalt
Technical Services
Bethlehem Steel Corporation

Mr. David M. Shupe
Retired, former Senior Research Manager
AlliedSignal, Inc.

Mr. Jonathan Sieg
Vice President/General Manager
Bay Networks, Inc.

New Advisory Board Members for the 1998-99 Academic Year

Mr. John R. Aberg
Manager
Aerospace Engineering R&D
Northrop Grumman Corporation

Mr. John C. Borum
Vice President
Lucent Technologies, Inc.

Dr. Glenn Roberts
Chief Engineer, Center for Advanced Aviation Systems Development
Mitre Corporation

Dr. William E. Witowsky
Sr. Vice President and Chief Technical Officer
TELOGY Networks, Inc.

Mr. Milan Vlajnic
Director of Engineering
Bay Networks, Inc.

Industrial Affiliates Program

The Department of Electrical Engineering's Industrial Affiliates Program (IAP) continued to display its vitality as a thriving collaborative effort between industry and the university last year, growing by three members. Bay Networks, Telogy Networks, and Radio Dynamics became the newest members of the program, joining eight other companies in an effort that has spawned increased research opportunities, scholarships, fellowships, job opportunities, and increased interaction between industry and the department's students and faculty.

The Industrial Affiliates Program is designed to promote relationships that foster the sharing of resources, knowledge and facilities in a synergistic climate of cooperation and growth. The department offers resources such as research facilities and personnel, graduating students, an extensive database of current and past research projects, and accumulated knowledge. Industry Affiliates' contributions include financial support and the insight and understanding into current real-world technical problems in the business world. This relationship promotes the identification and resolution of real world problems through the efforts of this larger community, formed from mutual need and developed with a vision of the future.

Participation in the Affiliates Program

The IAP is custom-designed to meet each individual member's needs. IAP member companies usually participate in one of the following three programs.

*Designated Graduate Fellowship and Undergraduate Scholarship*s: IAP members can support outstanding graduate students with named fellowships, or talented undergraduate students with named scholarships. While name recognition is sometimes the primary motivation and expected gain with these named fellowships and scholarships, some companies with critical needs for engineer recruits may add stipulations to their scholarship funding that require the student to interact with the company and/or serve internships in the company either during the school year or during the summer.

Pictured: *Students Melissa Moy and John Kim relax during the Research Internships in Telecommunications Engineering Program (RITE) Site visit to the facilities of IAP member Hughes Network Systems.*

Establishing and Maintaining Education and Research Facilities: Education and research facilities are critically needed at every level, from basic undergraduate teaching labs to facilities equipped with state-of-the-art equipment required for our world-renowned faculty's research projects. IAP members can donate laboratories in an area of critical need to their own business. Named after the company, the lab then provides a source of pride, name recognition and real benefit through trained potential new hires and faculty research conducted in the lab.

Establishing Faculty Development Awards: IAP members can establish development awards to help support the research and educational activities of one or more young and energetic faculty members in the areas of need to their business. The awardee will interact closely with the company and help strengthen the ties between the company and the department.

Additional Benefits to Members

- Departmental Resource Database
- Special Recruiting Events
- Advertisement of Job Openings
- Seminars
- Library Privileges
- Short Courses
- Web Page Links

Levels of Affiliate Participation

- Friends
- Small Business Affiliates
- Associates
- Partners

Current Affiliate Members

AlliedSignal, Inc.
Bay Networks, Inc.
Hughes Network Systems
Marconi Systems Technologies, Inc.
Northrup Grumman Corporation
Pulse Electronics
Mitre Corporation
Radio Dynamics, Inc.
Telogy Networks, Inc.
Texas Instruments, Inc.
TRW, Inc.

Pictured: *Ms. Jacqueline Rybacki, from affiliate member AlliedSignal, with students Mikhail Itskovich and David Wenzel, particiapants in the undergraduate Research Internships in Telecommunications Engineering (RITE) Site program.*

Chair's Report

Nariman Farvardin,
Professor and Chair

I am delighted to share with you the highlights of the collective accomplishments of the faculty, staff and students of the Department of Electrical Engineering during the period August 1997-August 1998. As you will note in the following paragraphs and in the body of the Annual Report, we have completed another year of strong performance, representing significant progress in a number of important areas.

New Faculty and Staff

For the second year in a row, we had a remarkably successful faculty recruitment effort that led to the hiring of five outstanding new faculty members: Prof. Manoj Franklin, in computer architectures (Ph.D., University of Wisconsin) who joined us after serving on the faculty of Clemson University for the past four years; Prof. Diana Marculescu, in power analysis for VLSI systems and embedded systems (Ph.D., University of Southern California); Prof. Haralabos Papadopoulos, in signal processing for wireless communications (Ph.D., Massachusetts Institute of Technology); Prof. Timothy Horiuchi, in analog VLSI (Ph.D., California Institute of Technology); and Prof. Patrick O'Shea, in microwave and beam technologies (Ph.D., University of Maryland) who will come back to his alma mater after having spent a few years in national labs and on the faculty of Duke University. The first three joined the department in Fall '98; Dr. O'Shea will join the department in Spring '99 and Dr. Horiuchi will join us in Fall '99. While Dr. O'Shea who will join us at the Associate Professor level, the other four are Assistant Professors. This will bring the number of faculty hired in the past two years to nine! These appointments add significant strength to the department in areas of critical and strategic importance. With these new appointments, 15% of all the faculty will be assistant professors–up from 5% only two years ago.

Another development that is likely to have an important impact on the future growth of the department is the approval of funding, through the Flagship Initiative, for expanding and strengthening our research and educational programs in information technology and in small smart systems. These new funds will allow us to continue adding new faculty in two areas of critical need and strategic importance for the department.

We continued to make progress in building a stronger administrative staff infrastructure. We hired Dr. Lisa Kiely, as the Academic Coordinator for Undergraduate Affairs, and Ms. Robyn Isom as Undergraduate Administrative Assistant. These two appointments have materially enhanced the quality and scope of the operations of our undergraduate office. We also hired Ms. Christine Weimer as Computer System Analyst to improve our computing services, and Mr. Asante Shakuur, as the Associate Director of the M.S. in Telecommunications Program, to launch a major expansion of the program. Finally, Ms. Karen Thornton was hired as the Coordinator for Personnel and Research.

Education Programs

During the past year, we awarded 153 B.S., 54 M.S. and 36 Ph.D. degrees in electrical engineering, 14 degrees in the M.S. in Telecommunications Program and six in the Master of Engineering Program.

The demand for the newly established computer engineering degree program has exceeded all expectations, thus presenting new opportunities and challenges. In just its second year, the computer engineering program has attracted the largest number of freshmen in the College of Engineering. In Fall '98, we had 114 freshmen in computer engineering (average SAT score 1309) and 69 freshmen in electrical engineering (average SAT score 1309). Compared to one year ago, the number of newly enrolled freshmen is down in electrical engineering and up in computer engineering. However, the aggregate freshman enrollment in these two programs represents a growth of more than 25% in one year and 75% in two years! As a result, the total undergraduate enrollment in the department has taken a sharp upward turn. What is most impressive is that this growth in enrollment is accompanied by an increase in the average SAT score of the newly enrolled students–a clear sign of a healthy, viable and high-quality academic program.

At the graduate level, our enrollment continues to grow. Our graduate student

recruitment efforts in electrical engineering were extremely successful. Of the nearly 1200 applications received, only 209 were admitted (approximately one in six) while 102 ended up joining our department. What is remarkable is the quality of these students as represented by an average GRE score of 2041! The enrollment in the M.S. in Telecommunications Program continues to increase, and, in view of our plans for expanding the scope and size of this program, I expect this trend to accelerate. The enrollment in the Master of Engineering Program also continues to grow.

The Department launched a new NSF-funded initiative last year to provide research experiences for undergraduates. This program, called Research Internships in Telecommunications Engineering (RITE), attracted 19 students from a very talented pool of 75 applicants. These students participated in a number of carefully designed research projects and learned how to work in a team environment. Students' research activites were augmented by field trips to telecommunications companies, and seminars on: trends and emerging technologies in telecommunications, technical communications, research careers and preparation for applying to graduate school. In addition to the University of Maryland, we had students from Carnegie Mellon University, Rensselaer Polytechnic Institute, George Washington University, and Virginia Polytechnic Institute. The students and the faculty were pleased by the program. Subsequently, many of the students are continuing their research projects over the academic year. We consider this a very important new initiative, and will be active in institutionalizing this program, as well as seeking funding from sources other than NSF to expand it even further.

To review our undergraduate curriculum, assess its strengths and weaknesses, and propose ideas for improving it, a one-day retreat was organized during the past summer. The attendees included a large number of faculty members, students and staff. The discussions in the retreat led to a set of recommendations that will serve as the starting point for the discussions of a Curriculum Revision Committee that was formed in Fall '98.

Research Programs

The research activities of the department continued to expand and branch out into new domains. The total research expenditures of the faculty in fiscal year 1998 exceeded $27,500,000, setting a new record (see Fig. 12, p. 37). A number of major block grants and a large number of smaller grants provide the funding for our ongoing research programs. Some of the block grants representing areas of significant research activity are listed below.

- *Information Sciences and Systems:* NASA Center for Satellite and Hybrid Communications; DoD funded initiative in automated vision/sending; two Army Research Laboratory Federated Labs in Advanced Communications and Information Distribution and in Advanced Sensors; DoD-funded Nonlinear Active Control of Dynamical Systems; DoD-funded Advanced Acoustics and Auditory Processing Center; and DoD-funded Design and Control of Smart Structures.
- *Electronic Sciences and Devices:* DoE-funded Accelerator Research Program; NSA-funded Supercomputer Optical Interconnects; NSA-funded Joint Program for Advanced Electronic Materials; DoD-funded Laboratory for Ion Beam Research and Applications; DoD-funded High Power Microwave Sources; NSF industry-funded Industry/University Cooperative Research Center in Optoelectronic Devices, Interconnects and Packaging; and the Army Research Laboratory Microelectronics Research Center.

Facilities

We have been working on improving the computer and laboratory facilities of the department, especially in areas of strategic importance and of high student demand.

The construction of our first computer-assisted instructional facility was completed and the facility began operation in Spring '98. This facility, called the *AlliedSignal Computer Classroom*, was funded by a generous gift from AlliedSignal Corporation and supports the instruction of a number of courses in the department. Construction of the *Integrated Circuit Fabrication Laboratory*, a new laboratory that supports both research and instruction, was also completed. For the first time, two sections of a senior-level integrated circuit fabrication laboratory course were offered in Fall '98, and both sections are full.

Construction of the *Jasmine International Telecommunications Instructional Laboratory* is well underway. This facility will consist of two components: A real-time communications system design teaching laboratory that was completed in Summer '98 and is fully operational now, and a computer-assisted instructional facility equipped with the state-of-the-art design and simulation tools for communications, networks and signal processing systems. The second component is under construction and will be operational in Spring '99. Finally, another major research and educational facility currently under construction is the *Marconi Computer Engineering Laboratory*, consisting of a computer architecture laboratory, an embedded systems laboratory, a

computer projects design laboratory and a general facility complementing the instruction of a number of lecture-based courses in computer engineering. This facility, funded by a generous gift from Marconi Systems Technologies, Inc., will dramatically enhance our new research and educational programs in computer engineering. We expect this facility to be operational in Spring-Summer '99.

Other Faculty and Staff News

After many years of dedicated and distinguished service to the institution, Professors Martin Reiser and Fawzi Emad retired last year. Like most other recent retirees, they will both remain involved with scholarly activities. In addition, three of our dedicated staff members, Ms. Barbara Aycock, Ms. Betty Penniman and Mr. Ron Sumner retired during the previous year. We are grateful to these colleagues for their contributions over the years and wish them a happy retirement.

The faculty and staff continued to receive prestigious awards and recognitions. Prof. Victor Granatstein received the 1998 Robert L. Woods Award for Excellence in Vacuum Electronics, Prof. Shuvra Bhattacharyya received the NSF CAREER Award, Prof. P. S. Krishnaprasad was selected as the 1998-2000 Distinguished Faculty Fellow, Prof. Romel Gomez received the George Corcoran Award for his significant contributions to electrical engineering education, and Prof. H. C. Lin received the Office of Technology Liaison Invention of the Year Award. Professor André Tits was elected Fellow of the IEEE. Mr. Eric Schurr received the Electrical Engineering Outstanding Staff Award for his service to the department.

Closing Remarks

I would like to express my thanks to all the faculty and staff who have been working relentlessly to propel our research programs forward, improve the quality of education we provide to our students, and enhance the image of the department within and outside the university. I take pride in the collective accomplishments of our faculty, staff and students, and will continue to work closely with them toward achieving higher levels of excellence with the aim of building one of the strongest electrical engineering educational and research programs in the nation.

Nariman Farvardin
Professor and Chair
Fall '98

1997-98 Faculty

Regular Faculty

Professors

Eyad H. Abed
Ashok K. Agrawala (*Affiliate*)
Thomas M. Antonsen, Jr.
John S. Baras
David F. Barbe
Gilmer L. Blankenship
Samuel J. Campanella (*Affiliate*)
Rama Chellappa
Mario Dagenais
Christopher C. Davis (*Associate Dean*)
Nicholas DeClaris
William W. Destler (*Dean*)
Fawzi P. Emad
Anthony Ephremides
Nariman Farvardin (*Chair*)
Jeffrey Frey
Evaggelos Geraniotis
Virgil D. Gligor
Julius Goldhar
Victor L. Granatstein
Ping-Tong Ho
Joseph F. JáJá
Perinkulam S. Krishnaprasad
Donald N. Langenberg (*Chancellor*)
Wesley G. Lawson
Chi H. Lee
William S. Levine
Armand M. Makowski
Steven J. Marcus
Isaak D. Mayergoyz
John Melngailis
Howard Milchberg
Kazuo Nakajima
Prakash Narayan
Robert W. Newcomb
Jon Orloff
A. Yavuz Oruç
Edward Ott
Martin Peckerar
Herbert Rabin (*Associate Dean*)
Martin P. Reiser
Moon-Jhong Rhee
Azriel Rosenfeld (*Affiliate*)
Shihab Shamma
Mark A. Shayman
Charles D. Striffler
André L. Tits
Thirumalai Venkatesan
Uzi Y. Vishkin
Kawthar A. Zaki

Associate Professors

Thomas E. Fuja
Neil Goldsman
James Hendler (*Affiliate*)
Agis Iliadis
K. J. Ray Liu
Adrian Papamarcou
Charles B. Silio
Leandros Tassiulas
Steven A. Tretter
Chia-Hung Yang

Assistant Professors

Shuvra Bhattacharyya
Joseph Bernstein (*Affiliate*)
Jerome A. Gansman
Romel D. Gomez
Jeffrey Hollingsworth (*Affiliate*)
Bruce Jacob
Peter Keleher (*Affiliate*)
David B. Stewart
Donald Yeung

Professors Emeriti

Lee D. Davisson
Robert O. Harger
Urs E. Hochuli
Panos Ligomenides
Hung C. Lin
Leonard S. Taylor
T. C. Gordon Wagner

Associate Professor Emeritus

James H. Pugsley

Other Faculty

Adjunct Professor

Hirsch Mandelberg

Research Associate Professor

Patrick Dowd

Adjunct Associate Professor

Joseph Mait

Assistant Research Scientists

Sambhu Agarwala
Pierre Barbier
Wei-Lou Cao
Brent Little
Daniel Maghere fteh
Saeed Pilevar
Penelope Polak-Dingels
Igor Smolyaninov

Research Associates

Walid Atia
Edward Burke
Robert E. Bartolo
Pak Shing Cho
Eric Funk
Peter Heim
Minna Hovinen
Valeria D. Kleiman
Kun-Jing Lee
Ying-Chang Liang
Jiang Liu
Scott Merritt
Daniel C. Parks
Alba Lalitha Ramaswamy
Claudio Serpico
Jun Shan Wey

Adjunct Research Associate

Steven Saddow

Faculty Research Assistants

Steven Baker
John C. Chu
Tie-Fu Ding
Timothy Filemyr
Russell Frizzell
Vildana Hodzic
David Huang
John V. Hryniewicz
Oliver King
Alan Klein
Xueli Qiao
David Rush
Ralph Whaley

Part-Time Lecturers

Charles Alexander
Michael Dellomo
Kamran Etemad
Allen Goldberg
William Hawkins
Nader Moayeri
Mansour Oveissi
B. James Wilson

1997-98 Staff

Director of Administrative Services
Terry M. Clark

Coordinator for Personnel and Research
Karen S. Thornton

Coordinator for Public Relations
Eric Schurr

Chair's Office

Nancy L. Swader
Executive Administrative Assistant I

Accounting Office

Julie O'Donnell
Acount Clerk II

Marion Devaney
Account Clerk III

Olivia M. Goetz
Program Management Specialist I

Claudia J. Hussey
Accounting Associate

Teresa Moore
Coordinator for Block Research Grants

Hilary E. Neal
Office Clerk II

Annie L. Poulin
Program Management Specialist I

Allison Spurrier
Coordinator for Block Research Grants

Graduate Office

Dorothy C. Chu
Program Management Specialist

Elisabeth El'Khodary
Academic Coordinator for Graduate Matters

Maria Hoo
Administrative Assistant II

Marlee McKenna
Administrative Assistant II

Pictured: Staff members joining the department withing the past year. Back row: Asante Shakuur. Front, from left to right: Lisa Kiely, Robyn Isom, Chirstine Weimer, Karen Thornton, Elisabeth El'Khodary and Heidi Herne.

M.S. in Telecommunications Office

Asante Shakuur
Associate Director, M.S. in Telecommunications Program

Undergraduate Office

Dolores A. Harris
Office Supervisor III

Robyn Isom
Undergraduate Administrative Assistant

Lisa Kiely
Academic Coordinator for Undergraduate Matters

Scientific Typists

Saroj Bhandari
Word Processing Operator Scientific

Patricia T. Keehn
Word Processing Supervisor

Katrina Greene
Administrative Assistant II

Computing Staff

Heidi Herne
Director, Computing Facilities

Elizabeth D. Penniman
Data Processing Production Control Manager

Rex L. Root
Data Processing Operations Manager

Christine Weimer
Systems Anaylist

Engineering Technicians

David Evans
Engineering Technician III

Shyam Mehrotra
Engineering Technician III

Robert Seibel
Engineering Technician III

Ronald Sumner
Supervising Engineering Technician I

Laboratory for Physical Sciences

Edgar Bilger
Storekeeper II

Robert Krause
Storekeeper II

1997-98 Faculty/Staff Honors and Awards

Faculty

Fellow, Institute of Electrical and Electronic Engineers
André Tits

Fellow, Institute of Electrical and Electronic Engineers
Nariman Farvardin

Robert L. Woods Award
Victor Granatstein

NSF CAREER Award
Shuvra Bhattacharyya

Office of Technology Liaison 1997 Invention of the Year Award
Hung C. Lin

Department of Electrical Engineering George Corcoran Award
Prof. Romel D. Gomez

Celebrating Teachers Award
Chia-Hung Yang, Kawthar Zaki

Distinguished Research Faculty Fellow
Perinkulum S. Krishnaprasad

Staff

Department of Electrical Engineering Staff Service Award
Eric Schurr

Spotlight

Prof. P. S. Krishnaprasad

Prof. Perinkulam S. Krishnaprasad was selected as one of three Distinguished Faculty Research Fellows for the period of 1998-2000. This university-wide award is intended to recognize "emerging, rising or recently recognized stars."

This award is a recognition of Prof. Krishnaprasad's tremendous research accomplishments and profound scholarly contributions over the years. Krishnaprasad's research interests lie in the broad area of geometric control theory and its applications.

Prof. Shuvra Bhattacharyya

Professor Shuvra Bhattacharyya received a National Science Foundation (NSF) Faculty Early Career Development (CAREER) Award in the area of Signal Processing Systems.

Dr. Bhattacharyya joined the department in the summer of 1997 from Hitachi America's Semiconductor Research Lab in San Jose, California. He received his Ph.D. from the University of California at Berkeley. His primary research interests are in computer-aided design for embedded systems, VLSI signal processing, parallel computation, and software synthesis.

The NSF CAREER Award is a foundation-wide program that encourages the integration of education and research.

Prof. André L. Tits

Prof. André Tits was elected Fellow of IEEE with the citation, "for contributions to optimization-based design and robust control."

Tits, who joined the University of Maryland in 1981, also serves as Associate Chair for Graduate Studies, and holds a permanent joint appointment with the Institute for Systems Research.

He is a member of the Mathematical Programming Society, the Society for Industrial and Applied Mathematics, and the Association des Ingénieurs sortis de l'Institut Montefiore. He was also the recipient of a 1985 NSF Presidential Young Investigator Award. He is currently the Editor, Technical Notes and Correspondence for *IEEE Transactions on Automatic Control.*

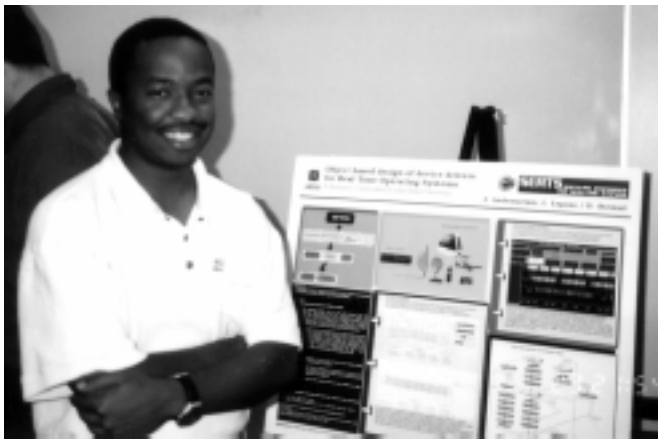
Dr. Tits' main research interests lie in various aspects of optimization-based system design and robust control. The Feasible Sequential Quadratic Programming (FSQP) algorithm, developed and refined over the past 10 years by an ISR/Electrical Engineering research group headed by Dr. Tits, is now in use at more than 500 sites worldwide.

Prof. Romel D. Gomez

Prof. Romel. D. Gomez received the department's George Corcoran Award for the 1997-98 academic year. This faculty award is presented for significant contributions to electrical engineering education, campus leadership, contributions at the national level, and creative and other scholarly activities.

Gomez, who joined the department in 1991, received his Ph.D. in Physics from the University of Maryland in 1990. His research focuses on information storage technology and the fundamental nanoscopic properties of magnetic thin films. He is engaged in the development of scanned probe magnetic microscopy to understand the physics of magnetism at reduced dimensions, as well as the development of new magnetic devices that utilize the novel properties of magnetic films at the nanometer length scales. With more than 30 authored papers and U.S. Patents on these and other related subjects, Gomez also serves as editor for *IEEE Transactions on Magnetics,* and is a member of the Editorial Board.

Education Programs



Pictured: *Student Lesley Leposo, from Carnegie Mellon University, displaying a poster presentation of his research project at the Research in Telecommunications Engineering (RITE) Site fair. Lesley, along with eighteen other students, participated in the NSF-funded RITE Site summer program. Lesley's research project was titled "Object-Based Design of Device Drivers for Real-Time Operating Systems: A Remote Controlled Embedded System."*

The Department of Electrical Engineering's educational programs feature innovative academic and research initiatives, talented and enthusiastic students, and a team of distinguished and internationally recognized faculty. The department's educational activities during the past year are summarized in the following pages.

Pictured: *The University's new Integrated Circuit Fabrication facility, used for a new senior-level course in microchip fabrication.*

Pictured: *The new AlliedSignal Computer Classroom, featuring the latest in computerized instruction technology.*

Undergraduate Programs

The Department of Electrical Engineering continued to strengthen its activities in the area of undergraduate education. Highlights of the 1997-98 academic year include the inauguration of the Computer Engineering degree program, now the most popular major for new students in the Clark School of Engineering; and the first Research Internships in Telecommunications Engineering (RITE) program, held during the summer under sponsorship from the National Science Foundation.

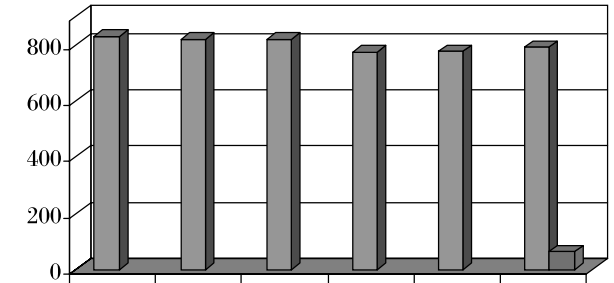
Student Recruitment and Retention

In an effort to attract highly talented high school students from Maryland and elsewhere, the Department continues to supplement (and in certain cases match) merit scholarships awarded by the Clark School of Engineering and the Office of Undergraduate Admissions. While the majority of the Department's scholarship funds are provided by industrial affiliates, a significant portion is contributed by faculty. The Department advertises its undergraduate programs to more than 150 high schools and is also planning a number of high school visits during the 1998-99 period. Recent recruitment efforts have resulted in notably higher yield rates, with the Fall 1998 yield rate surpassing the two-thirds mark.

An important priority for the Department is to provide a diverse and supportive environment for women and under-represented racial groups. In Spring 1998, 129 women and 89 African American undergraduates were enrolled. In an effort to further support the two undergraduate programs, the Department more than doubled the number of Undergraduate Teaching Fellowships it offered to students. These awards provide qualified undergraduates with opportunities to assist their peers in lower-division courses.

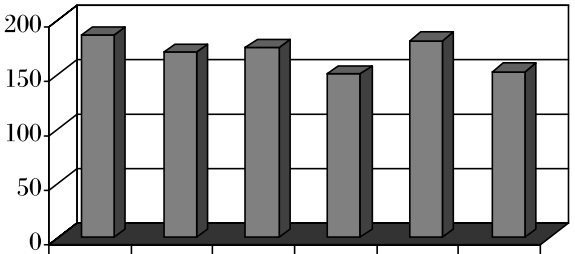
Enrollment and graduation statistics are

Fig. 1. Undergraduate Enrollment in Electrical Engineering and Computer Engineering



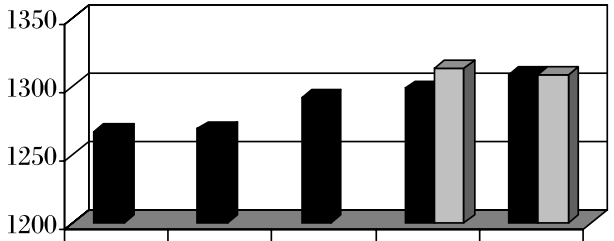
	Spg. 93	Spg. 94	Spg. 95	Spg. 96	Spg. 97	Spg. 98
EE	828	819	820	773	775	792
CP						64

Fig. 2. Baccalaureate Degrees Awarded in Electrical Engineering



	92-93	93-94	94-95	95-96	96-97	97-98
B.S.	187	171	175	151	182	153

Fig. 3. SAT Scores for Entering First-Year Students



	94	95	96	97	98
EE	1267	1269	1292	1299	1309
CP				1314	1309

shown in Figures 1 and 2, while student SAT scores and demographics are summarized in Figures 3 and 4. It should be noted that the total first-year enrollment in the two degree programs, Electrical Engineering (EE) and Computer Engineering (CP) increased from 139 in Fall 1997 to 183 in Fall 1998. At the same time, the enrollment ratio between the two majors changed dramatically in favor of Computer Engineering: EE enrollment dropped from 92 to 69, while CP enrollment rose from 47 to 114. The average SAT scores for the Fall 1998 entering students was 1309 (same for EE and CP), up four points from the Fall 1997 average.

Fig. 4. EE and CP Undergraduate Student Demographics: Spring 1998

	Electrical Engineering	Computer Engineering
Total Students	792	64
Women	121	8
African-American	82	7
Hispanic	29	4
Native American	1	0

Educational Innovation

The Department has initiated a review of its undergraduate programs to assess their effectiveness in meeting the evolving needs of the electrical and computer engineering professions, and in educating a diverse and growing constituency of students. In August, 20 members of the faculty and 20 undergraduate students gathered at a retreat to exchange ideas on curriculum improvement. Parallel sessions explored the themes of computer-aided and laboratory instruction, technical content, professional components, student preparation, and long-term visions for the Department's educational mission. Several areas of improvement were identified, and participants concurred that a thorough review of the curriculum was necessary. An ad hoc committee will continue work on the issues raised during the retreat, and will make concrete recommendations on curriculum reform.

The Department added new instructional and research facilities last year which will be of particular benefit to undergraduate students. The AlliedSignal Computer Classroom, a state-of-the-art computer-aided instructional facility accommodating 24 students, was opened in Fall 1997. The classroom is currently being used for lectures and recitations in three undergraduate courses. The Marconi Computer Engineering Laboratory will open in 1999. It will incorporate research laboratories in computer architecture and embedded systems, as well as instructional areas and workspace. The Jasmine International Telecommunications Instructional Facility will be fully operational by early 1999. The two instructional laboratories in the Jasmine Facility will be equipped with computer workstations, digital signal processor-based hardware and software, and other instructional telecommunications modules.

A new senior-level course in microchip fabrication was introduced for the Fall 1998 semester. The course is being taught by Professor Melngailis in the Integrated Circuit Fabrication Laboratory. Student response has been enthusiastic, and course enrollment is expected to double for the Spring 1999 semester.

Undergraduate involvement in research projects continues to grow. In addition to the activities of the RITE Site (see below), the Department also showcased its undergraduate projects in design competitions and exhibits nationwide. An interdisciplinary project involving electrical engineering, mechanical engineering and computer science majors was featured in an international pinball machine competition in February 1998. In addition, two Maryland EE teams, led by Professor David B. Stewart, were among the ten finalists in the 1998 Motorola University Design Contest for computer chip-based applications.

The systematic integration of research into the undergraduate curriculum continues to be a key priority. In Fall 1997, the department initiated the Indoor Wireless Project with funding from the National Science Foundation. This project course, targeted at seniors and beginning graduate students, combines instruction with research in the areas of communications, signal processing and networking. The goal of the project is to design, implement and test a wireless network for two-way voice communication, data transfers

Pictured: (from left to right) Rite Site students Meenakshi Narayanan, Melissa Moy, Zeggai Andemariam, Jeffrey Hazen, Susan Tsao, Lesley Leposo, Jarriel Cook, Alan Leung, John Kim, Jiwanjot Tulsi, Justin Bowlus, Mikhail Itskovich, Matthew Guyton, Julian Requejo, and Thomas Carley.

Pictured: *RITE Site Students Julian Requejo, Jeffrey Hazen and Meenakshi Narayanan display their research project, "Trade off Between Speech Compression and Channel Coding for a Fixed Transmission Rate" during the RITE Site Fair.*

and (eventually) video transmission on an adaptable hardware platform.

Research Internships in Telecommunications Engineering (RITE)

During the summer of 1998, the Department launched its Research Internship in Telecommunications Engineering (RITE) Site initiative. The RITE Site provides opportunities for undergraduate students from Maryland and elsewhere to engage in research in the broad area of telecommunications. Funding for this initiative is provided by the National Science Foundation under its Research Experiences for Undergraduates (REU) program.

The RITE Site matches undergraduates, typically entering their junior or senior years, with individual or team projects supervised by faculty. In addition to conducting research, students participate in field trips to companies and government labs, attend technical presentations given by experts in the telecommunications field, and receive career guidance as well as information on graduate study in the field. Participants receive a stipend and are compensated for travel, room and board (as appropriate). Most students are also given the option of continuing their projects during the academic year.

This year's pool of applicants comprised 75 students. Half of those accepted to the Site where chosen from universities other than Maryland. The final yield was nineteen highly talented and enthusiastic interns, who made their vibrant presence felt throughout the Department.

At the end of the eleven-week program, students gave oral presentations and poster demonstrations of their projects at the RITE Site Fair. The projects were reviewed by a panel consisting of EE faculty and experts from industry. Participants, projects and awards are listed below.

Research Internships in Telecommunications Engineering (RITE) Site Presentations and Posters

"Echidna: A Reconfigurable Real-Time Operating System for Digital Signal Processors"
Students: Melissa Moy and Thomas Carley, *Best Project Award*
Advisor: Dr. David B. Stewart

"MMSE Reconstruction of Wavelet Encoded Images"
Student: Teen Sheng, *Best Project Award*
Advisor: Dr. Nariman Farvardin

"Auditory Measures of Speech Intelligibility"
Student: Matthew Guyton, *Most Promising Project Award*
Advisor: Dr. Shihab Shamma

"Characterization of an Optical Communications Channel"
Students: Ronald De Guzman and David Wenzel
Advisor: Dr. Christopher Davis

"Quality of IP Telephony in the Presence of Network Congestion"
Students: Susan Tsao and John Kim
Advisor: Dr. Mario Dagenais

"Trade off Between Speech Compression and Channel Coding for a Fixed Transmission Rate"
Students: Meenakshi Narayanan, Jeffrey Hazen and Julian Requejo
Advisor: Dr. Adrian Papamarcou

"Low Overhead Motion Compensation for Video Coding"
Student: Jarriel Cook
Advisor: Dr. Nariman Farvardin

"Dynamic Packet Reservation Multiple Access Performance Evaluation"
Student: Alan Leung
Advisor: Dr. Nariman Farvardin

"Phase Delay Implementation for Noise Reduction in Earphones"
Student: Jiwanjot K. Tulsi
Advisor: Dr. Hung C. Lin

"Object-Based Design of Device Drivers for Real-Time Operating Systems: A Remote Controlled Embedded System"
Students: Lesley Leposo and Zeggai Andemariam
Advisor: Dr. David B. Stewart

"Design of Plastic Cell Architecture"
Students: Dan Roddy, Justin Bowlus and Mikhail Itskovich
Advisor: Dr. Kazuo Nakajima

Graduate Programs

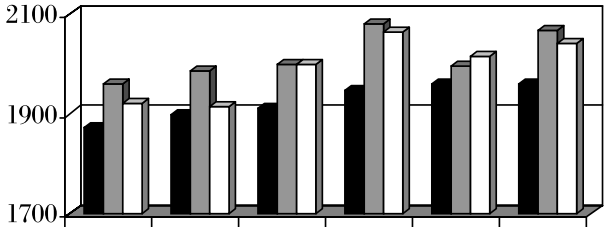
Exciting new developments took place this past academic year on all fronts of the graduate program, namely: the traditional M.S. and Ph.D. programs in Electrical Engineering; the more recently established cross-disciplinary M.S. program in Telecommunications, which the department administers, and the Professional Master of Engineering program, administered by the School of Engineering, in which the department participates.

M.S. and Ph. D. in Electrical Engineering

The graduate programs in Electrical Engineering continue to climb the top ranks! Last year's internal review of our department (within the context of all the university's graduate programs) was stellar. The department was listed as one of six to receive *Special Distinction* among the 13 programs labeled as having achieved Established Excellence. This achievement is echoed in the department's national ranking. According to the 1995 report of the National Research Council on Research-Doctorate Programs, among public institutions, the Department's ranking was second best among all electrical engineering departments on the eastern seaboard and 9th among all electrical engineering departments in the United States. As another indicator of our collective progress, in early 1998, the College of Engineering was ranked 8th nationally among public institutions, by *U.S. News and World Report.*

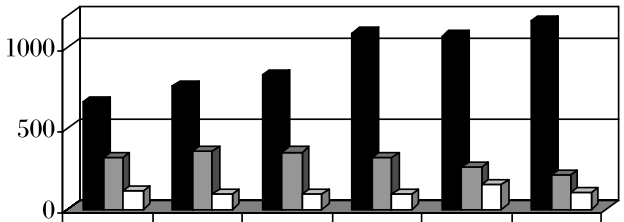
With this momentum, we continue to strengthen our graduate program every year. On the curricular front, this year we made major changes to the M.S. and Ph.D. degree requirements. In particular, all our students must now perform outstandingly in core graduate courses. With regards to the caliber of our graduate students, our applicant pool continues to grow in number and quality (see Figs. 5 and 6). This year we processed close to 1200 applications

Fig. 5. Average GRE Scores



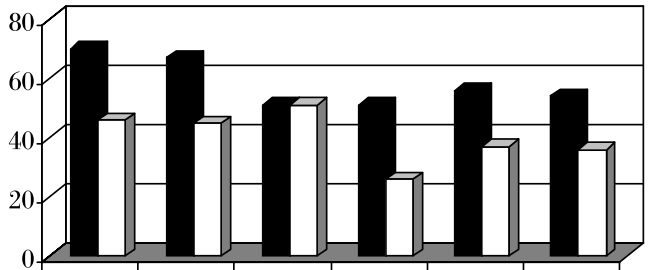
	1993	1994	1995	1996	1997	1998
Applicants	1872	1899	1910	1947	1960	1961
Admits	1961	1986	1999	2081	1997	2067
Enrolls	1922	1914	2000	2063	2016	2041

Fig. 6. Number of Applicants, Admitted and Enrolled Students



	1993	1994	1995	1996	1997	1998
Applicants	664	766	830	1092	1073	1166
Admits	321	361	353	320	264	209
Enrolls	115	93	92	95	149	102

Fig. 7. Graduate Degrees Awarded



	92-93	93-94	94-95	95-96	96-97	97-98
M.S.	70	67	51	51	56	54
Ph.D.	46	45	51	26	37	36

and admitted a very select few. The GRE scores of these very bright 209 students who were admitted averaged 2067, clearly showing that our program's caliber is growing concurrently with its attractiveness.

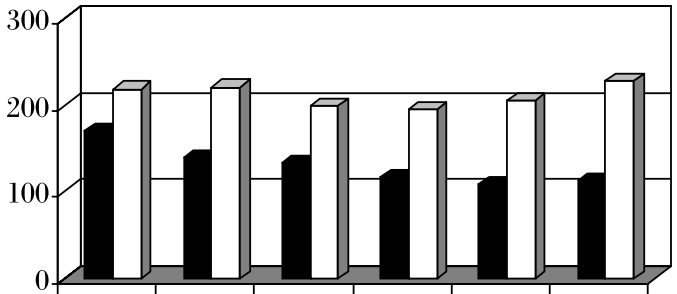
Our enrollment remains steady, the trend being toward higher proportions of Ph.D. students (see Fig. 8) and full-time students (see Fig. 9). Nearly all full-time graduate students receive full financial aid. In 1997-98 there were 42 graduate teaching assistants, 179 graduate research assistants, and 51 graduate fellows. During the Spring 1998 semester, 53 of our students were women.

We have also enriched our course offerings in terms of advanced topic courses, covering state-of-the-art research. Examples of such courses this past year include: Multi-user Information Theory and Cryptography; Digital Image Processing; Modeling, Analysis, and Optimization of Embedded Software; Microelectronics Device Reliability; Materials and Processes for Microelectronics; Passive and Low Power Microwave Devices; Modern Analytical and Geometric Approaches to Classical Mechanics and Control Theory I & II and Microarchitecture.

This past academic year, we awarded 54 M.S. degrees and 36 Ph.D. degrees. See Fig. 7 for a history of degrees awarded over the recent past. We are proud of our recent graduates who continue to get prestigious positions in the industry and academia. Especially noteworthy are the recent successes achieved by Jiping He (Ph.D. 1988) who has just received tenure at Arizona State University, Department of Chemical, Bio and Materials Engineering and Yagyensh C. Pati (Ph.D. 1992) who became President and CEO of Numerical Technologies, Inc.

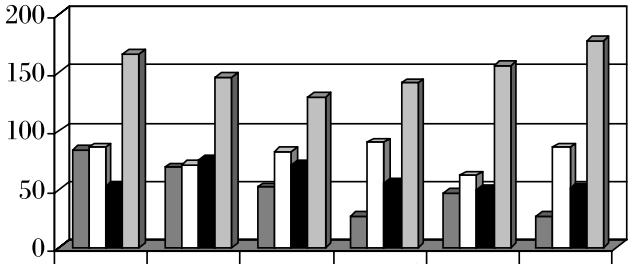
Finally, the administrative structure of our graduate office has been significantly strengthened, with the creation of the position of Academic Coordinator for Graduate Matters, occupied by Ms. Elisabeth El'Khodary (Welcome Elisabeth!). The Academic

Fig. 8. EE Graduate Enrollment



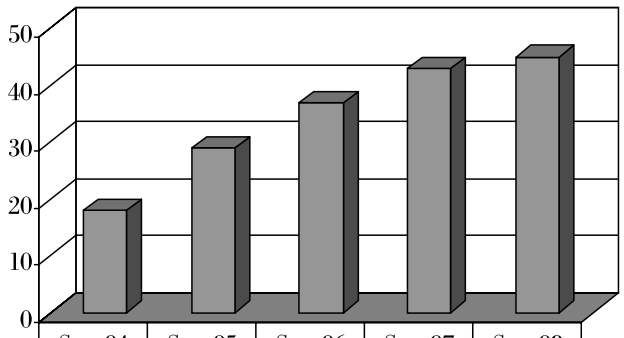
	Spg. 93	Spg. 94	Spg. 95	Spg. 96	Spg. 97	Spg. 98
M.S.	170	140	134	117	109	113
Ph.D.	219	221	200	196	206	228

Fig. 9. Total EE Graduate Enrollment: Full or Part-Time



	Spg. 93	Spg. 94	Spg. 95	Spg. 96	Spg. 97	Spg. 98
M.S. P-T.	84	69	52	27	47	27
M.S. F-T.	86	71	82	90	62	86
Ph.D. P-T.	53	75	71	55	50	51
Ph.D. F-T.	166	146	129	141	156	177

Fig. 10. Enrollment in the M.S. in Telecommunications Program



	Spg. 94	Spg. 95	Spg. 96	Spg. 97	Spg. 98
Enrollment	18	29	37	43	45

Coordinator is responsible for all administrative matters of relevance to the M.S. and Ph.D. programs in Electrical Engineering.

M.S. in Telecommunications

The Master of Science in Telecommunications degree program, developed in 1993 and administered by the Department of Electrical Engineering, has grown into a vibrant academic program. With the explosive growth of the telecommunications industry, global economic trends and corresponding technological expansion, the department decided last year to take measures to expand this successful degree program even further.

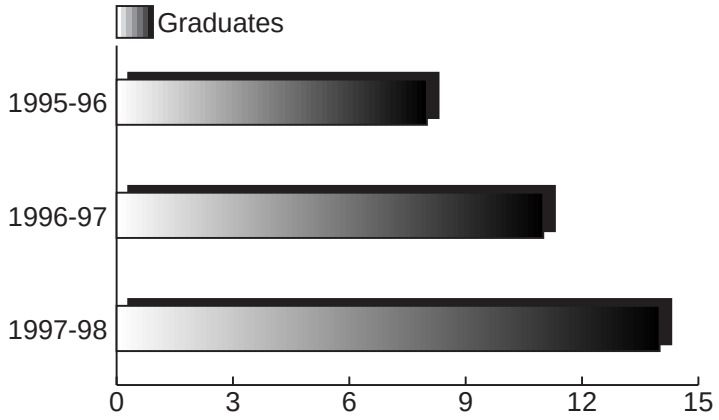
In the past five years, student enrollment has more than doubled (see Fig. 10). New, state-of-the-art classes have been developed, such as PCS System Implementation, Economics of International Telecommunications, and Introduction to Cellular Communication Networks, to ensure that the latest developments in telecommunications technology are offered in instruction.

The Department hired Asante Shakuur last year as Associate Director for the M.S. in Telecommunications Program. Mr. Shakuur will implement a more aggressive student recruiting strategy, bringing this exciting, innovative program to even more local industry and government professionals. Last year, 46 students were enrolled in the program. The department's goal is to have 100 students actively enrolled by the Fall 2001 semester.

In an effort to help facilitate the program's expansion, as well as continue to offer the latest in contemporary telecommunications instruction, Dr. Subramanian Raghavan was hired through a joint appointment with the College of Business and Management. Another new faculty member will also be hired.

Students in the program have come from companies such as Bell Atlantic, Hughes Networks Systems, Computer Sciences Corporation, MCI, Baltimore Gas & Electric, and the FCC. Graduates have gone on to work for corporations such as Sprint, Texas Instruments, GE Information Systems, and NSA. Last year, 14 students graduated from the program (see Fig. 11).

Fig. 11. M.S. in Telecommunications Degrees Awarded



The M.S. in Telecommunications program offers a unique, cross-disciplinary training in telecommunications to professionals in the areas of telecommunication systems technology, management, regulatory, and policy issues. In accord, the program draws upon the strengths of four nationally-renowned colleges and schools at Maryland–Engineering; Business and Management; Computer, Math and Physical Sciences; and Public Affairs.

Core coursework includes work in signals and system theory, network design and management, plus current policy and economic factors driving the global industry. In addition, industry leaders offer seminars on current telecommunications issues, balancing the technical, regulatory, managerial and economic factors at work today.

Communication and network classes are taught by faculty from the departments of Electrical Engineering and Computer Science. Management issues in the telecommunications industry are addressed in courses offered by the College of Business and Management. Legal and regulatory policies are studied in courses taught by stellar scholar-practitioners from the School of Public Affairs.

The following courses were offered in the program last year:

- Telecommunications Project
- Principles of Telecommunications Systems
- Management and Organizational Behavior in the Telecommunications Industry
- The Economics of International Telecommunications Policy and Regulation
- Competitive Strategies and Public Policies in Telecommunications
- Telecommunications Marketing Management
- Telecommunication Networks
- Communication Protocols
- Network Security
- Network Software Design and Performance
- Digital Signal Processing
- Network Management
- Introduction to Cellular Communication Networks
- Telecommunications Seminar
- Design and Analysis of Telecommunication Systems
- PCS System Implementation
- Network Implementation in Operating Systems

Professional Master of Engineering

The Professional Master of Engineering Program is a practice-oriented, part-time graduate program designed to assist engineers and scientists in the development of their professional careers, providing them with the technical expertise needed in business, government and industrial environments. Students in the program have the opportunity to upgrade and expand their knowledge in their respective disciplines and, in some cases, embark upon a new career path.

During the third year of its operation, the program offered 15 areas of options or concentration, covering a broad spectrum of engineering technology that reflects faculty expertise and changing needs within the professional engineering community.

Interest in the program has grown markedly. Students currently in the program reside in 16 counties plus the City of Baltimore.

The Electrical Engineering option of the Professional Masters in Engineering Program requires four courses from a major core area, three courses from a minor core area, and three technical electives. The major and minor core areas are selected by the student. The current core areas and courses are:

Communications and Signal Processing

- Probability and Stochastic Processes for Engineers
- Analog and Digital Communication Systems
- Data Networks
- Theory and Applications of Digital Signal Processing
- Wireless Communication Networks

Computer Engineering

- Computer System Design and Architecture
- Software Design and Implementation
- Microprocessor System Design
- Digital VLSI Design

Additional core areas will be developed as the demand arises.

During the 1997-98 academic year, 64 of a total of 362 students chose Electrical Engineering as their focus of study. In addition, six of the 46 students who graduated from the program last year chose Electrical Engineering as their main field of study.

Student Honors, Awards, and Scholarships

Undergraduate Students

The following 1997-98 graduates received significant honors:

Summa Cum Laude

Kareem Aggour
Shahana Aziz
Julie Fredlin
Nguyen Nguyen
Shiou Sam
Nedim Softic
Yu Wang

Magna Cum Laude

Erton Boci
Nicholas Kohout
Herman Lo
Jeng Lung
Wei-Chung Wu

Cum Laude

Diane Lee
Huy Nguyen
Kevin Shaw
John Spickes
Duc-Hein Tran
Kevin Woodling

Graduated with EE Honors

Kareem S. Aggour
Christopher E. Classon
Stacy L. Fargo
Julie Freidlin
Victoria Hao
Caleb T. Kemere
Jeng C. Lung
Kfir Meidav
Stephen Neuendorffer
Mark L. Plett
Kevin E. Shaw
Yu Wang

Eta Kappa Nu

Fall 1997 Graduates

Olena Aleksyenko
Michael Doster
David Hawk
Tara Hutchings
Sezin A.Omer
Mark Plett
Christopher C. Purdy
Hemant Shah
Erik Shipley

Spring 1998 Graduates

Kareem Aggour
Geoffrey Bloom
Edward Craft
Stacy Fargo
Victoria Hao
Giftson James
Caleb Kemere
Nicholas Kohout
Diane Lee
Herman Lo
Thanh Xuan Luu
Kfir Meidav
Susanna Meinecke
Stephen Neuendorffer
Billy Ng
Tanit Pongsiri
Tony Quach
Brian Riley
Kevin Shaw
John Spickes
Truong Tran

Eta Kappa Nu Outstanding Electee Award

This award is presented to a new member for outstanding performance in the electee program and for participation in student activities.

Roger Chen
Kevan Lee

Eta Kappa Nu Outstanding Senior Award

This award is presented to a senior in Electrical Engineering for outstanding achievement and service to the Eta Kappa Nu Society and the department.

Arnold Liu

Department of Electrical Engineering Outstanding Academic Performance Award

Melany R. Arjona
Juliean G. Requejo Massacance

Institute of Electrical and Electronics Engineers Outstanding Student Award

This award is given to a member who has shown outstanding commitment to the organization and to Electrical Engineering.

Mehul Gandhi

Department of Electrical Engineering Chair's Award

This award is given for outstanding academic performance by a graduating senior:

Julie Freidlin
Yu Wang

Department of Electrical Engineering Service Award

This award is presented to students for demonstrating commitment to service for their fellow students:

Curtis R. By
Ana Cases
Mark T. Curse
Wen-Szu Lin
Omar M. Sharieff
Nauman Uppal

1997-98 George Corcoran Memorial Award

This award is given in recognition of excellence in teaching by a graduate student.

Roberto Martinez

Scholarships

Anderson Consulting Scholarship
Stephen Neuendorffer

Bay Networks Scholarship
Melany Arjona
Julian Requejo Massacane

Jack I. and Dorothy G. Bender Scholarship
Eric Dunn
Bruce Knepper
Nguyen P. Nguyen

Boeing Scholarship
Renee Tolbert

Hughes Network Systems Scholarship
Melany Arjona
Jose Goldamez
David Greer
Sean Hairston
Daniel Valencia
Alexander Vaughn

Knust Scholarship
Richard Martin
Scott Tater
Nauman Uppal

Litton Amecom Scholarship
Anne Pak

Old Crows/Capitol Club
Kevin Shaw

Philippine Association of Metropolitan Washington Engineers Foundation Scholarship Fund
Marco Roxas

Pulse Electronics Scholarship
Shahana Aziz
Wei-Chung Wu

Sciulli Scholarship
Diane Lee

Tretter Scholarship
Radmil Elkis
Michael Gouel
Yu Wang

EE Merit Scholarship
Kristen Behnke
Daniel A. Bendor
Jonathan Black
Michael Cocozza
Brian Detwiler
Matthew DeVillier
Jeremy M. Eckman
Ryan Enck
Eric M. Fiterman
Dvin J. Gallicchio
Jennifer Hathaway
Dennis E.Hsii
Paul J. Kohout
James R. LaDuca
Asher S. Lazarus
Jeffrey R. McIlvain
Michael Miller
Edward L. Pearl
Daniel Petkovsek
Lee Reynolds
Andrew R. Sheahen
Andrew C. Stockham
Jeanne Sun
Jiwanjot K. Tulsi
Vincent M. Weaver
Eric M. Wescott
Allen Yeh

Student Organizations

EE Graduate Student Association (EEGSA) Officers:
President, Tahereh Fazel
Vice President for Academic Affairs, Zhiagang Bian
Vice President for Social Affairs, Raadhakrishnan Poovendran
Secretary, Bin Ming

Eta Kappa Nu Officers 1997-98
President, Nicholas Kohout
Vice President, Tanit Pongsiri
Treasurer, Brian Riley
Recording Secretary, Joseph Chen
Corresponding Secretary, Stacy Fargo

IEEE Officers 1997-98
Chair, Marcellus Proctor
Vice-Chairs, Anan Akundi, Michelle Saini
Treasurers, Kiatsiak Ploosawasdi, Graham Edwards
Secretary, Sharief Youssef

Harmonic Coalition Officers, 1997-98
Co-Presidents, Wen-Szu Lin and Omar Sharieff
Treasurer, Mark Cursey
Public Relations, Curtis Bly, Ana Casas and Tanit Pongsiri
Technical Consultant, Nauman Uppal

Spotlight

Pictured: *(from left to right) Several of the founding members of the Harmonic Coalition: Mark Cursey, Omar Sharieff, Kent Horng, Wen-Szu Lin, Curtis Bly, Nauman Uppal, Johnny Pongsiri, and Ana Casas.*

The Harmonic Coalition

A group of 50 juniors and seniors formed a new student group called the Harmonic Coalition during the spring of 1997.

The student advising group, founded by co-presidents Omar Sharieff and Wen-Szu Lin, aims at helping to facilitate the adjustment of incoming undergraduate students to the rigors of the Electrical and Computer Engineering degree programs, and to the atmosphere of a large university. Through one-on-one interaction, social events, and access to a large pool of upperclass students, the Harmonic Coalition offers its members the benefits of friendship, guidance, and fun.

The Harmonic Coalition pairs first-year and transfer students with juniors and seniors, who act as both peer advisors and friends to the new students. Contact between a mentor and mentee can be as frequent as both would like, however, the group recommends that they correspond at least weekly–whether by phone, in person, or through email.

The Harmonic Coalition also functions as a social organization, featuring football tailgates, group trips to basketball games, and other member-oriented events.

Graduate Degrees Granted

Ph.D. August 1997

Dhar, Nibir, "*The Mechanics of CdTe/ZnTe Nucleation on (112) Si for HgCdTe Infrared Photodiode Arrays.*"
Thesis Advisor: Dr. N. Goldsman

Guan, Lee, "*Message Routing and Problem Solving in Multiprocessor Networks.*"
Thesis Advisor: Dr. R. Greenberg

Jafarkhani, Hamid, "*Wavelet Coding of Images: Adaptation, Scalability, and Transmission over Wireless Channels.*"
Advisor: Dr. N. Farvardin

Kanlis, Angelos, "*Compression and Transmission of Multiresolution Data.*"
Advisor: Dr. P. Narayan

Li, Huai, "*Model-Based Image Processing Techniques for Breast Cancer Detection in Digital Mammography.*"
Advisor: Dr. K. J. R. Liu

Peris, Vinod, "*Architecture for Guaranteed Delay Service in High Speed Network.*"
Advisor: Dr. A. Makowski

Prather, Dennis, "*Analysis and Synthesis of Finite Aperiodic Diffractive Optical Elements using Rigorous Electromagnetic Models.*"
Advisor: Dr. C. Davis

Roan, Gary T., "*Time Domain Analysis of Microwave Devices by the Finite Difference Time Domain Method.*"
Advisor: Dr. K. Zaki

Sampath, Balaji, "*Subspace Approaches for Blind Equalization and Identification.*"
Advisor: Dr. K. J. R. Liu

Ph.D. December 1997

Chen, Po-Yueh, "*VLSI Architectures for Adaptive Image Compression Using Discrete Wavelet Transform.*"
Thesis Advisor: Dr. J. JáJá

Chou, Chih-Hsien, "*Traffic Analysis, Source Modeling, and Performance Evaluation of Multi-Media ATM Networks.*"
Thesis Advisor: Dr. E. Geraniotis

Coraluppi, Stefano, "*Optimal Control of Markov Decision Processes for Performance and Robustness.*"
Thesis Advisor: Dr. S. Marcus

Fang, Chung-Chieh, "*Sampled-Data Analysis and Control of DC-DC Switching Converters.*"
Thesis Advisor: Dr. E. Abed

Gregory, Jospeh A., "*Characteristics and Time Evolution of a Magnetized Hollow Cathode Glow Discharge in Air.*"
Thesis Advisor: Dr. W. Destler

Li, Mien, "*Computer-Aided Methodology for Analyzing IC Process and Device Manufacturability.*"
Thesis Advisor: Dr. L. Milor

Li, Pen Chung, "*Effects of Nonlinear Distortions on M-PSK DS/CDMA Systems–Performance Evaluation and Design.*"
Thesis Advisor: Dr. E. Geraniotis

Ligdas, Paschalis, "*Transmission Power Control for Fading Channels with Limited Feedback.*"
Thesis Advisor: Dr. N. Farvardin

Manikonda, Vikram, "*Control and Stabilization of a Class of Nonlinear Mechanical Systems with Symmetry.*"
Thesis Advisor: Dr. P. S. Krishnaprasad

Rashid-Farrokhi, Farrokh, "*Combined Power Control Space-Time Diversity for Cellular Communications.*"
Thesis Advisor: Dr. K. J. R. Liu

Stuemper, Herbert Karl, "*Motion Control for Nonholonomic Systems on Matrix Lie Groups.*"
Thesis Advisor: Dr. P. S. Krishnaprasad

Wang, Chi, "*Modeling of Conductor, Dielectric Loaded Resonators, Filters and Double Ridge Waveguide T-Junctions.*"
Thesis Advisor: Dr. K. Zaki

Ph.D. May 1998

Chao, Liang-Chiun, "*A Spherical Aberration Corrector Using Space Charge.*"
Thesis Advisor: Dr. J. Orloff

Chen, Chung-Hsin, "*Nanofabrication of High Temperature Superconductor Josephson Junctions.*"
Thesis Advisor: Dr. T. Venkatesan

Chen, Jie, "*Low-Power Architectures and VLSI Design of Video Coding Systems.*"
Thesis Advisor: Dr. K. J. R. Liu

Choudhry, Zafar, "*Estimating Performance of Communications Protocols from Formal Specifications.*"
Thesis Advisor: Dr. V. Gligor

Cornwell, Donald M., "*A Miniature LIDAR Wind Profiler for the Planetary Boundary Layer Using Semiconductor Lasers.*"
Thesis Advisor: Dr. C. Davis

Douglas, Bruce, "*Figure Control of a Flexible Astronomical Mirror.*"
Thesis Advisor: Dr. W. Levine

Kim, Taihyn, "*Noisy Precursors for Nonlinear Systems with Application to Axial Flow Compressors.*"
Thesis Advisor: Dr. E. Abed

Liu, Chunbo, "*Study of Electron Beam Quality in Gyrotron Guns and Design of a Dual-Cavity Input Circuit for a High Power Gyroklystron.*"
Thesis Advisor: Dr. T. Antonsen

Liu, Shang Chieh, "*New Space-Time Processing Techniques for Spread-Spectrum Wireless Networks.*"
Thesis Advisor: Dr. E. Geraniotis

Phillips, William C., "*SAR Image Understanding: High Speed Target Detection and Site Model Based Exploitation.*"
Thesis Advisor: Dr. R. Chellappa

Singh, Sanjeev K., "*VLSI Design of Functional Artificial Neural Networks Using Semistate Theory with a Robotics Application.*"
Thesis Advisor: Dr. R. Newcomb

Singh, Surinder P., "*Modeling Multi-Band Effects of Hot-Electron Transport in Small Silicon Devices by a Deterministic Solution of the Boltzmann Transport Equation Using Spherical Harmonics.*"
Thesis Advisor: Dr. I. Mayergoyz

Ulman, Robert J., "*Detection Emitter Motion Using Time and Frequency Difference of Arrival.*"
Thesis Advisor: Dr. E. Geraniotis

Vusirikala, Vijayanand "*Semiconductor Lasers for Low-loss, Alignment Tolerant Coupling to Single Mode Fibers.*"
Thesis Advisor: Dr. M. Dagenais

Wang, Weizhong, "*Self-Aligned Buried Implant Mextal-Oxide-Semiconductor-Field-Effect-Transistor Facbrication.*"
Thesis Advisor: Dr. J. Melngailis

M.S. Thesis Option, August 1997

Arora, Guarav, "*Automated Analysis and Prediction of Timing Parameters in Embedded Real-Time Systems Using Measured Data.*"
Thesis Advisor: D. Stewart

Bei, Junyan, "*Design of a Software System for Optimization-Based CAD.*"
Thesis Advisor: Dr. A. Tits

Borbath, Michael R., "*Characterization of Crosstalk in Erbium-Doped Fiber Amplifiers.*"
Thesis Advisor: Dr. C. Davis

Copeland, David J., "*Electrical Design of a 40 Gbps WDM Laser Module.*"
Thesis Advisor: Dr. M. Dagenais

Michail, Anastassios, "*A Distributed Routing Algorithm for Supporting Connection-Oriented Service in Wireless Communication Networks with Changing Connectivity.*"
Thesis Advisor: Dr. A. Ephremides

Ozgul, Melih, "*A Facility for Designing and Simulating Interconnection Network.*"
Thesis Advisor: Dr. A. Y. Oruç

Singh, Gagan D., "*Reservation Based MAC Protocol for a Wireless ATM LAN.*"
Thesis Advisor: Dr. J. Baras

M.S. Thesis Option, December 1997

Banerjee, Amit, "*Foliage-Penetrating SAR Image Analysis.*"
Thesis Advisor: Dr. R. Chellappa

Johnson, Brian F., "*A Two-Stage Quantizaer for Coding Speech Line/Spectrum Parameters.*"
Thesis Advisor: Dr. N. Farvardin

Lang, Jun, "*A Distributed and Time-Bounded Exception Handling Mechanism for Dynamically Reconfigurable Real-Time Software.*"
Thesis Advisor: Dr. D. Stewart

Park, Vincent D., "*A Highly Adaptive Distributed Routing Algorithm for Mobile Wireless Networks.*"
Thesis Advisor: Dr. L. Tassiulas

Patel, Piyush S., "*DSP Applications in Communications Using Motorola's 5600x Family of Digital Signal Processors.*"
Thesis Advisor: Dr. S. Tretter

Stevens, Carl C., "*Experimental Evaluation of Gabor Decomposition in the Detection and Matching of Fingerprinting Minutiae.*"
Thesis Advisor: Dr. R. Chellappa

Tachatraiphop, Sukanya, "*Diode-Pumped Continuous Wave Hybrid Nd: Phosphate Glass and Nd: YVO_4 Laser.*"
Thesis Advisor: Dr. C. Lee

M.S. Thesis Option, May 1998

Ercetin, Ozgur, "*Information Delivery in Two-Stage Satellite-Terrestrial Wireless Networks.*"
Thesis Advisor: Dr. L. Tassiulas

Fruth, Frank, "*Adaptive Antenna Arrays for CDMA Wireless Multimedia Communication Systems.*"
Thesis Advisor: Dr. E. Geraniotis

Goyal, Anuja, "*Optimization of Perovskite Manganese Oxide in Thin Films for Uncooled Infrared Detector Applications.*"
Thesis Advisor: Dr. T. Venkatesan

McLaughlin, Thomas F., "*A Psychophysical Auditory Model Applied to Perceptual Audio Coding.*"
Thesis Advisor: Dr. S. Shamma

Moldoveanu, Veronica, "*Case Studies in Computer-Aided Control System Design.*"
Thesis Advisor: Dr. W. Levine

Moulin, Sophie Carine, "*Convolutional Codes that Exploit the Residual Redundancy in Multiband Harmonic Vocoders.*"
Thesis Advisor: Dr. T. Fuja

Yonce, David, "*Device and Circuit Optimization Using Focused Ion Beam Doping Implants.*"
Thesis Advisor: Dr. N. Goldsman

Young, Eric, "*Linear Program for Determining the Optimal Dose Modulation to Correct Proximity Effects in Electron Beam Lithography.*"
Thesis Advisor: Dr. M. Peckerar

M.S. Non-Thesis, August 1997

Berkoski, Leonard
Advisor: Dr. D. Stewart

Erfani, Shabnam
Advisor: Dr. V. Gligor

Floroiu, Cezar Andrei
Advisor: Dr. V. Gligor

Xia, Xuyang
Advisor: Dr. C. Silio

M.S. Non-Thesis, December 1997

Anjum, Farooq
Advisor: Dr. L. Tassiulas

Bhukhanwala, Niraj. P.
Advisor: Dr. M. Dagenais

Haritaoglu, Esin
Advisor: Dr. R. Chellappa

Khairy, Mohamed M.
Advisor: Dr. E. Geraniotis

Koley, Bikash
Advisor: Dr. M. Dagenais

Taylor, Angela P.
Advisor: Dr. S. Tretter

Womack, Lucas
Advisor: Dr. C. Silio

Xu, Jianzhong
Advisor: Dr. E. Abed

Yang, Shu
Advisor: Dr. C. Lee

Zhang, Wei
Advisor: Dr. V. Gligor

Zhang, Zhitao
Advisor: Dr. C. Davis

M.S. Non-Thesis, May 1998

Arora, Anubhav
Advisor: Dr. J. Baras

Chen, Bin
Advisor: Dr. J. Baras

Chen, Yi
Advisor: Dr. A. Tits

Duan, Lingze
Advisor: Dr. V. Granatstein

Fielding, Alexander J.
Advisor: Dr. C. Davis

Ge, Yanwei
Advisor: Dr. A. Papamarcou

Gregory, Brian P.
Advisor: Dr. G. Blankenship

Jiang, Yimin
Advisor: Dr. J. Baras

Kaiser, Faez
Advisor: Dr. C. Silio

Kanlis, Nikolaos
Advisor: Dr. S. Shamma

Ke, Jing
Advisor: Dr. C. Silio

Kubina, Jennifer M.
Advisor: Dr. C. Davis

Ma, Yuan
Advisor: Dr. N. Goldsman

Madhanagopal, Sunil
Advisor: Dr. N. Goldsman

Wang, David
Advisor: Dr. K. Nakajima

Xu, Yingjiu
Advisor: Dr. P. S. Krishnaprasad

Research Activities

Research Activities Overview

The department's research activities cover a broad range of areas that can be generally divided into (i) Information Sciences and Systems, and (ii) Electronic Sciences and Devices.

Information Sciences and Systems

Research in this general area includes communications and signal processing, control systems and computer engineering.

In **communications and signal processing**, the thrust of our research is in: speech, image and video processing; computer vision; VLSI signal processing; signal compression; error control coding; modems; spread spectrum communications; communication networks; satellite and hybrid networks; and wireless systems (link and network).

In **controls**, the faculty are engaged in theoretical research on: nonlinear & stochastic models; process modeling; hybrid systems; adaptive & robust control; optimization; and geometric methods and motion control. The technologies they are researching include: control prototyping; smart sensors and actuators; smart machines; intelligent materials processing; and power system stability and control.

In **computer engineering**, our major activities are in: high performance systems; computer architectures; software engineering (real-time systems); embedded systems; VLSI (system) design; VLSI CAD Tools; computer security; distributed operating systems, and computer interconnection networks.

Pictured: *Prof. Martin Reiser, in the Electron Beam Laboratory, which is also affiliated with the Institute for Plasma Research. Research in the laboratory focuses on the study of the behavior and properties of high current beams with strong space-charge forces for advanced particle accelerator applications—such as high-energy physics colliders, heavy ion inertial fusion, nuclear waste transmutations and energy production, spallation neutron sources for material research, medical therapy, high-power microwave and free electron laser generation.*

Electronic Sciences and Devices

Research in this general area includes electrophysics and microelectronics.

In the area of **electrophysics**, our activities include research on: chaos, magnetics, superconductivity, accelerator systems, microwave sources, plasma science, III-V optoelectronics, optoelectronics packaging, optical communications; optical sensors, and WDM technologies.

In **microelectronics**, faculty members are engaged in research projects on: device and circuit modeling; semiconductor materials and devices; quantum effect devices; compound semiconductor devices; technology and applications of ion beams; and circuit design and testing.

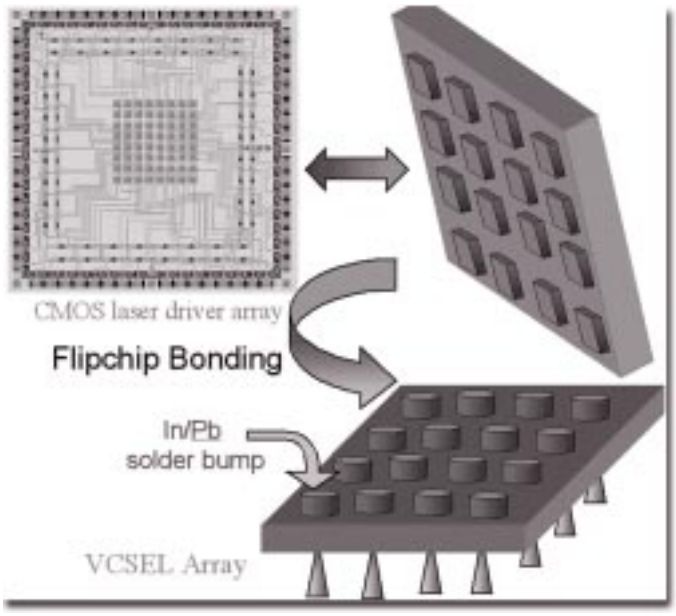
The department is affiliated with several major research units and centers within the university. Together, they feature more than 50 laboratories for research and education.

With more than $27 million in research expenditures last year, the department is involved in extensive research partnerships with industry, government organizations, and other universities. This section summarizes the department's research activities. Specific faculty members' research interests and activities can be found in the Faculty Profiles Section.

Affiliated Research Units

The Department of Electrical Engineering is affiliated with many major research units at the University of Maryland. These affiliations give faculty members and students access to highly specialized, state-of-the-art computing and laboratory facilities, as well as the chance to engage in exciting collaborative and cross-disciplinary research projects.

The Department interacts closely with the following major research institutes and centers.



Pictured: *(top left) A packaged smart pixel array, or 2-dimensional laser array with a silicon-based logic circuit integrated with it. The flipchip bonding process used to integrate VCSEL (vertical cavity laser arrays) with computer chips is also depicted on the right side of the picture. The research shown here is being conducted in the Center for Optoelectronic Devices, Interconnections and Packaging.*

Center for Automation Research (CFAR)

The objective of the Center for Automation Research is to conduct research in computer vision and robotics. The largest Laboratory in CFAR is the Computer Vision Laboratory. The Media section of the Language and Media Processing Laboratory (LAMP) is also part of CFAR. In addition, the Autonomous Mobile Robotics Laboratory and Robotics Laboratory are affiliated with CFAR. Focal points of research in CFAR include aerial image understanding, automatic target recognition, geometric processes and properties, navigation, document understanding, video segmentation, and autonomous robotics. Prof. Azriel Rosenfeld, an Affiliate Professor in the Departments of Computer Science and Electrical Engineering, is the Director of CFAR.

Center for Optoelectronic Devices, Interconnections and Packaging (COEDIP)

COEDIP is a University of Maryland/ University of Arizona Joint NSF Industry/University Cooperative Research Center conducting research in the areas of design, fabrication, integration, optical interconnects, packaging, reliability testing, and manufacturing of optoelectronic devices and subsystems. Industrial and government participation in the Center is strongly encouraged. Prof. Mario Dagenais, from the Department of Electrical Engineering, is the Center Co-Director.

Center for Satellite and Hybrid Communication Networks (CSHCN)

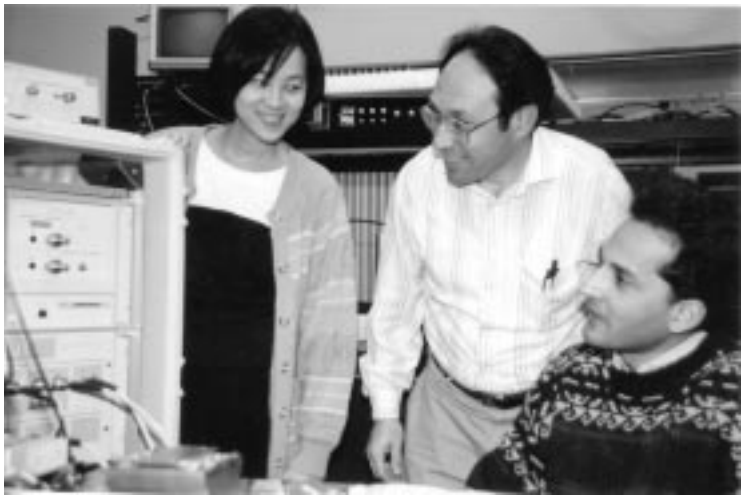
CSHCN, a NASA Commercial Space Center, is sponsored by NASA, the Department of Defense and industry. Established in 1991, it focuses on hybrid and satellite communications and networking research, education and technology development. The program emphasizes break-through research on the seamless interconnection and interoperation of hybrid networks (i.e. heterogeneous networks consisting of wireless, wireline, fiber and satellite subnetworks). Key research areas emphasized are: interoperability, asymmetric links, network management, resource allocation, mobility, dynamic routing, wireless access schemes, Internet over hybrid networks, ATM hybrid networks, wireless broadband networks, information distribution and "push" technologies, network planning and performance evaluation. The center has a state-of-the art research laboratory on Hybrid Networking.

The center maintains several testbeds, including one on modeling and simulation of large heterogeneous networks, and one on Internet over hybrid wireless networks. The center works closely with leading telecommunication industry partners for the rapid commercialization of research findings. It also maintains an intensive industrial collaboration program, including a comprehensive internship program for graduate and undergraduate students. The CSHCN Director is Prof. John Baras, from the Department of Electrical Engineering.

Center for Superconductivity Research (CSR)

The Center for Superconductivity Research directs interdisciplinary research in basic and applied

superconductivity. The faculty members associated with the Center have appointments with the Departments of Physics, Chemistry, Electrical Engineering, and Materials Science. The Center's goals are: 1) to increase knowledge of the phenomena of superconductivity and of superconducting materials; 2) to train students needed for future superconducting technologies; and 3) to interact with industry in the development of superconducting applications. The Director of CSR is Prof. Richard L. Greene, from the Department of Physics.



Pictured: (from left to right) Student Sharon Yu, Prof. Julius Goldhar, and Asst. Research Scientist Daniel Mahgerefteh, working on a fibre optic experiment at the Larboratory for Physical Sciences, a DOD Laboratory adjacent to the University of Maryland campus.

Engineering Research Center (ERC)

The ERC was established to promote interaction in engineering and science between the university and the business and industrial community. The ERC addresses the needs of technology-oriented companies in Maryland and forms relationships with industry on a national and international level as well. Through its innovative Maryland Industrial Partnerships (MIPS) program, the ERC offers matching funds for joint industry/ university R & D projects, carried out at the university, that have potential to stimulate the growth of industry in Maryland. Other ERC programs are the Technology Extension Service (TES), a statewide industry assistance program; the Technology Advancement Program (TAP), an incubator located on the College Park campus, for technology based start-up companies; and the Technology Initiatives Program (TIP), which supports university facilities of importance to industry. The Director of the ERC is Prof. Herbert Rabin, Associate Dean for Research and professor in the Department of Electrical Engineering.

Institute for Plasma Research (IPR)

IPR is a multidisciplinary center of excellence for basic and applied research on the topics of charged particle beams, plasmas, and nonlinear dynamics. Major research areas include particle accelerator science and relativistic microwave electronics, ion beam microfabrication and lithography, nonlinear dynamics (chaos), intense laser matter interaction, and controlled thermonuclear fusion (in both magnetically confined plasma and inertially confined plasma). The Acting Director of IPR is Prof. Thomas Antonsen, from the departments of Electrical Engineering and Physics.

Institute for Physical Science and Technology (IPST)

The mission of IPST is to foster excellence in both experimental and theoretical research. The primary focus is on areas which are interdisciplinary in nature and which fall outside the mainstream of departmental interest. Most IPST faculty members hold joint appointments with one of the academic departments, primarily Physics, Mathematics, Engineering, and Chemistry. The institute strives to provide an environment in which both experimental and theoretical research can flourish. The Director of the institute is Distinguished University Professor James A. Yorke.

Institute for Systems Research (ISR)

The Institute for Systems Research (ISR) is a global leader and innovator in the integrated design for control of complex engineering systems. It was founded in 1985 as a National Science Foundation Engineering Research Center, and is now a permanent Institute of the University of Maryland. ISR supports and pursues an exciting variety of centers, major programs and research projects.

ISR's cross-disciplinary research and learning environment is unparalleled at other U.S. universities. The Institute's research teams successfully join faculty and students from 11 academic departments with working engineers in industry and government to address the larger, systems-level problems associated with engineering technology. Together, they integrate control, communications, and computation with physical and process knowledge. The results are better systems, methodologies and engineering products involving mechanical, electrical, material, chemical, civil and aeronautical technologies.

ISR engages industry in every aspect of its research and educational programs. The environment, organization, and capabilities of ISR promote research that reduces cycle times for technology development and transfer to industrial applications.

ISR's broad range of educational programs are closely linked with its research objectives. ISR's hands-on, cross-disciplinary learning opportunities span pre-college to postgraduate education. The Institute administers the Master of Science in Systems

Engineering program, the campus-wide Gemstone honors program for undergraduates, and the Young Scholars program for talented high school students. Prof. Gary W. Rubloff directs ISR. He holds a joint appointment with ISR and the Department of Materials and Nuclear Engineering.

Laboratory for Physical Sciences (LPS)

LPS is a DOD Laboratory adjacent to the University of Maryland campus. LPS conducts collaborative research in advanced electronics materials, high speed optical information processing, magnetic imaging, and wavelength division multiplexed computing networks (the Lightning project) with Electrical Engineering faculty. The Director of LPS is Dr. Geoffrey L. Burdge.

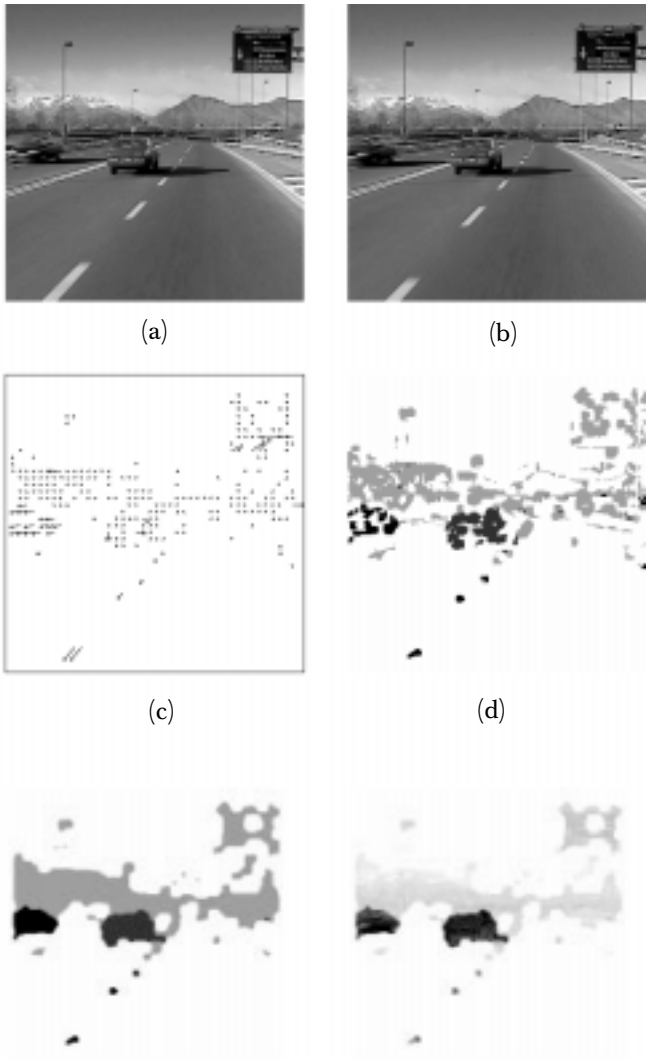
Microelectronics Research Center (MRC)

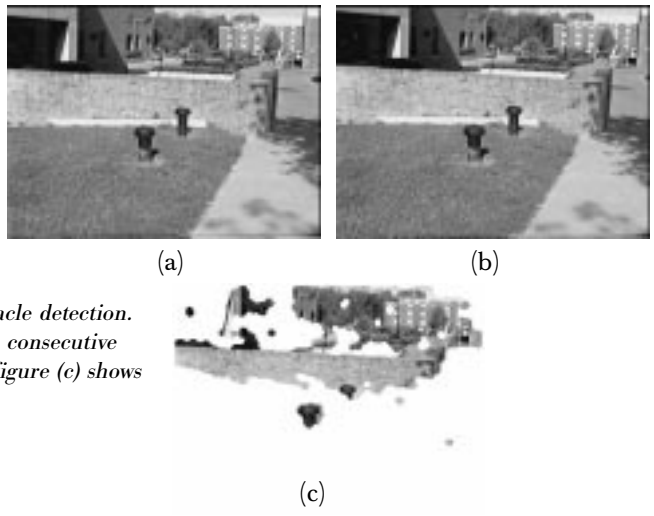
MRC is a newly established research center funded through a cooperative agreement with the Army Research Laboratory. The Center's research activities focus on the following areas: nanoelectronics, optoelectronics, biological/chemical detection science, high frequency RF electronics, and ultrafast optics. The Center's research activities are cross-disciplinary in nature and involve, in addition to Electrical Engineering, faculty and students from the Nuclear and Materials, Mechanical, and Chemical Engineering departments, as well as the Department of Physics. The MRC Director is Prof. William Destler, from the Department of Electrical Engineering.

University of Maryland Institute for Advanced Computer Studies (UMIACS)

The mission of the University of Maryland Institute for Advanced Computer Studies (UMIACS) is to promote excellence in interdisciplinary research in computing at the College Park campus. The Institute conducts major research programs in computer vision, high performance computing, multimedia and interactive systems,

Pictured: Computerized motion detection. Figures (a-f) represent independent motion detection; (a) and (b) are two consecutive frames of the detection sequence, (c) computed flow, (d) computed depth map, (e) raw, and (f) cleaned regions showing independent motion. The research shown here and below was conducted in the Image Processing Laboratory, which is also affiliated with the Center for Automation Research.





Pictured: Computerized obstacle detection. Figures (a) and (b) depict two consecutive frames of a sequence, while figure (c) shows the located obstacles.

artificial intelligence, software engineering, databases, and algorithms. UMIACS' environment is enriched by a strong outreach program that includes close collaboration with industry and government laboratories on focused research projects and the organization of seminars and workshops in emerging technology areas.

The UMIACS Director is Prof. Joseph JáJá from the Department of Electrical Engineering.

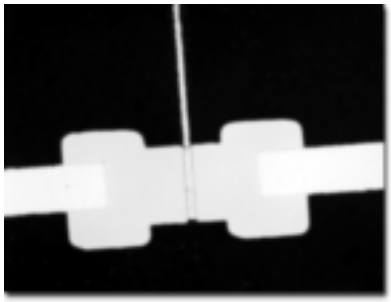
The University of Maryland Materials Research Science and Engineering Center (MRSEC)

The University of Maryland Materials Research Science and Engineering Center (MRSEC) is part of a national network of materials research centers funded by the National Science Foundation. The MRSEC's activities focus on three general areas: 1) materials research; 2) industrial outreach; and 3) educational outreach.

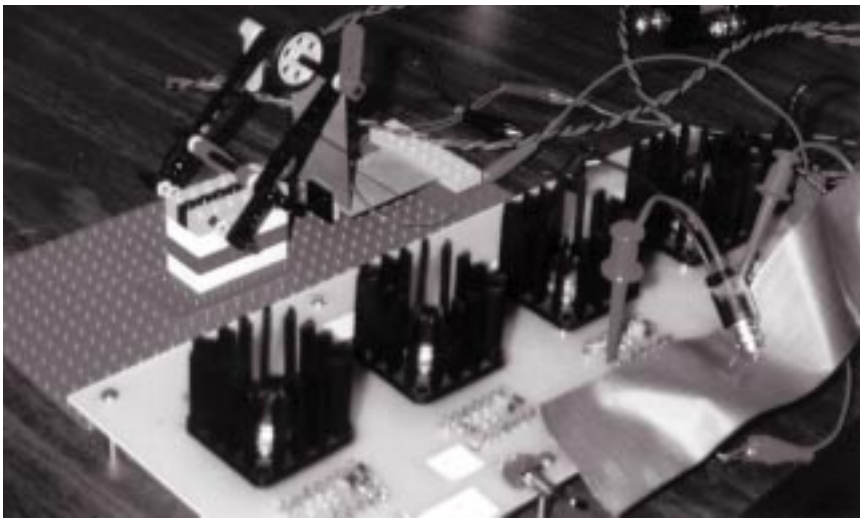
MRSEC currently includes 21 faculty members, as well as research associates and assistants from five departments and three colleges at the University of Maryland. The Center's research is focused on two areas of advanced materials technology. The first is Thin Film Metal Oxides, perfecting techniques for fabricating thin films of new materials with novel electrical and magnetic properties. The second is Dynamics of Surface Morphology, developing techniques to image and model the novel behavior of solid materials in extremely small structures.

In addition to its research goals, MRSEC is dedicated to inspiring future scientists and engineers to achieve scientific excellence, in a context of community service and economic accountability. Prof. Ellen D. Williams, from the Department of Physics, is the Director of MRSEC, and Prof. Ramamoorthy Ramesh of the Department of Materials Science and Engineering is the Associate Director. MRSEC's web address is http://mrsec.umd.edu.

Pictured: *(left) Student Marcel Pruessner applies an adhesion promoter to a silicon wafer, which will have resist spun on it, in the new Integrated Circuits Fabrication Course. The facility used in this course is housed in the Institute for Plasma Research.*



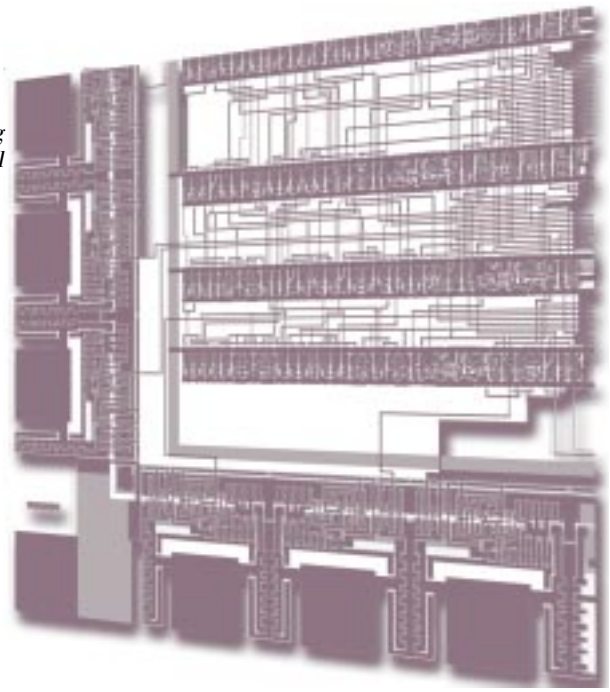
Pictured: *(above) A 2 micrometer gate-length test transistor, fabricated in the Integrated Circuit Fabrication Course.*



Pictured: *A demonstration of work done by Miriam Betnun (MIT class of 2001) during the summer of 98 as an REU student in the Intelligent Servosystems Laboratory. The idea is to show how a pair of piezo-electric benders configured to trace a Lissajous figure at the distal end under periodic driving can be used to produce uni-directional (i.e. rectified) rotary motion. In the experiments conducted with this motor, Miriam studied the dependence of the ratio (output RPM)/(input frequency) on the phase difference between the driving sinusoids to the benders.*

Major Research Laboratories

The following is a list of the major research laboratories in the Department of Electrical Engineering. These laboratories include significant specialized equipment, and involve a large number of researchers. These laboratories are categorized into two groups: (i) Information Sciences and Systems, and (ii) Electronic Sciences and Devices. For each laboratory, the following information is provided: name of the laboratory, location, director, brief description of the laboratories purpose and goals, major equipment, other participating faculty, affiliation with other organizations, and supporting agencies/industry participants.



Pictured: A Very Large Scale Integrated (VLSI) computer chip, designed by undergraduate students in the VLSI Design Automation Laboratory, a teaching lab that is supplemented by several of the department's research laboratories. The chips students design in this laboartory are sent off to be made, and then tested when they return. This provides students a unique opportunity to not only see how their designs work in theory, but to also see if they actually work. With the explosive growth of the Computer Engineering Degree Program, and the construction of the new Marconi Systems Technologies Computer Engineering Facility, students will soon have more chances to work in the areas of computer architecture, microprocessor design, software engineering for real-time systems, and embedded systems.

Information Sciences and Systems

Communications and Signal Processing Laboratory

2454 A.V. Williams Building
Director: Dr. Nariman Farvardin

The Communications and Signal Processing Laboratory conducts research on the development, analysis, and simulation of (i) point-to-point and multi-user communication systems, and (ii) speech, image and video processing algorithms, with an emphasis on wireless multimedia communication.

Major Equipment: A dozen Sun SparcStations of various types; general purpose DSP boards; audio I/O and storage facilities; image and video processing equipment; state-of-the-art software for communication system design, channel simulation, and signal processing.

Participating Faculty: Drs. A. Ephremides, T. Fuja, J. Gansman, E. Geraniotis, R. Liu, A. Papamarcou, L. Tassiulas, S. Tretter.

Affiliation: EE, ISR, ERC

Supporting Agencies/Industry Participants: NSF, ARL, ONR, AFOSR, NSA, NIST, AT&T/Lucent Technologies, Texas Instruments, Mitsubishi Electric, GTE Labs, IBM, Intel.

Computer Aided Control Systems Engineering Laboratory

2158 A.V. Williams Building
Director: Dr. Raymond A. Adomaitis

The primary goals of this laboratory are to perform research on optimization based design, software systems for control system design, robust and nonlinear control synthesis, and systems modeling methodologies for simulation and control of materials manufacturing processes and aircraft propulsion systems. Current topics of study are: RTP System Gas Phase Simulation and Model Reduction; Intelligent Materials Processing; and Turbocompression System Instabilities.

Major Equipment: Numerous Sun workstations, PC's.

Participating Faculty: Drs. E. Abed, A. Austin, J. Baras, P. S. Krishnaprasad, W. Levine, A. Tits, E. Zafiriou.

Affiliation: EE, ISR.

Supporting Agencies/Industry Participants: NSF, AFOSR, NASA, NRL, ARI, Advanced Micro Devices, Inc., Northrop-Grumman Corp., Silvaco, Westinghouse.

Digital Signal Processing Laboratory

1416 A.V. Williams Building
Director: Dr. Shuvra S. Bhattacharyya

The Digital Signal Processing Laboratory is the research laboratory for signal/image processing and communications. Research in this facility covers various important areas ranging from theoretical analysis and

algorithm development to design and implementation of signal processing systems.

Major Equipment: One DEC AlphaStation, SparcStations of various levels, one Video Capture and Digitizer Board, and various other peripheral devices.

Participating Faculty: Drs. J. Gansman, K. J. R. Liu, and B. Papadopoulos

Affiliation: EE, ISR

Supporting Agencies/Industry Participants: NSF, ONR, NIH, ARL, MIPS, Micro-Star, Inc., Westinghouse, Watkins-Johnson Co., AlliedSignal, and Minta Martin Foundation.

Image Processing Laboratory

4438 A.V. Williams Building
Director: Dr. Rama Chellappa

In this laboratory we develop algorithms for image stabilization, motion estimation, image compression, and face recognition. A system is also being developed for monitoring images.

Major Equipment: Several Sun SparcStations, optical tables, CCD cameras, and linear rail for acquiring calibrated images.

Participating Faculty: Drs. Y. Aloimonos, L. S. Davis, A. Rosenfeld.

Affiliation: EE, CFAR, UMIACS

Supporting Agencies/Industry Participants: ARPA.

Intelligent Servosystems Laboratory

2210 A.V. Williams Building
Director: Dr. P. S. Krishnaprasad

The primary goal of this laboratory is to advance the state of the art in the design and real-time control of sophisticated servosystems such as computer controlled robotic hands, multi-degree of freedom robotic manipulators, and flexible space structures with distributed sensors. In addition to the creation of test-beds to support research in this arena, the laboratory is also engaged in the development of specialized sensory processing hardware, and distributed object-oriented software environments for the systematic exploitation of 3-D graphical animation and visualization.

Major Equipment: Computational: 8 high-end graphics workstations including 2 SGI Indy-2 machines with virtual reality tools, PC's and peripherals. Experimental: General Electric Robot - teaching tool plus a platform for the modular dexterous hand, ISI AC-100 real-time control prototyping system with MATRIX software and a custom interface, and networking components for the study of control networks; various measurement, testing and electronic assembly tools.

Participating Faculty: Drs. E. Abed, D. Akin, M. Austin, J. Baras, W. P. Dayawansa, S. Shamma, A. Tits, L.-W. Tsai, D. Tsakiris, G. C. Walsh.

Affiliation: EE, ISR

Supporting Agencies/Industry Participants: NSF, AFOSR, NASA, NRL.

Medical Informatics and Computational Intelligence Laboratory

1366 A.V. Williams Building
Director: Dr. Nicholas DeClaris

The laboratory conducts research at the leading edge of Medical Informatics and Computer Engineering involving High Performance Computing and Communication Technologies and their applications to engineering and/or medicine. Current emphasis is on (I)Theory and Design of Intelligent and Knowledge-Based Systems, (ii) Cluster and Machine Similarity Measures Representations using Human Perceptual Knowledge, Learning and Experimentation; (ii) Machine Concept Formation and Task Decomposition with Applications to Planning and Decision Making; and (iii) Machine Functional Units and Architectures inspired by Brain Structures and Functions. Ongoing projects include: (1) Integration of Intelligent Relational Database Management Systems, Expert and Fuzzy Systems, Learning Algorithms and Neural Networks; (2) Theory

Pictured: *A new image coding technology, called Lossy/Lossless Region-of-Interest (ROI) Coding. The research was conducted by Mr. Eiji Atsumi, from Mitsubishi Electric Corporation, and Prof. Nariman Farvardin, in the Communications and Signal Processing Laboratory, which is also affiliated with the Institute for Systems Research. This coding scheme has been proposed to the JPEG-2000 standards committee.*

The ROI (face of the girl) is identified in the middle of encoding. PSNR of the whole image: 28.77 dB; bit-rate: 0.083 bpp.

Lossless reconstruction of the ROI through ROI coding. PSNR of the whole image: 29.35 dB; bit-rate: 0.454 bpp.

Lossless reconstruction of the whole image through no ROI coding: bit-rate: 4.393 bpp.

and Design of Hierarchical Planing for Intelligent Systems; (3) Simulation and Design Evaluation using Intelligent System Testbeds; (4) Knowledge Based Tools for Diagnosis, Model Building, Decision Making, Discovery and Path Planning for Autonomous Vehicles; and (5) Content-Based Image Characterization, Storage and Retrieval.

Major Equipment: Two Sun multiprocessors, ten Sun SparcStations; state-of-the-art software for designing and implementing cognitive information selection schemes, expert and database management systems, neural networks, fuzzy systems and data visualization schemes.

Participating Faculty: Drs. P. Cano, S. Fritz, V. Megaloiconomou, C.L.Kauffman, R. W. Newcomb, S. Silverberg, E. Steinberger, C. Silio, B. F. Trump, C. H. Yang and Messrs. J.W. DeClaris and D. Shalvi.

Affiliation: EE, UM Cancer Center, Confocal Microscope and High Performance Computing and Communication Laboratories/ Pathology, Image Physics Laboratory/ Radiology, Tinnitus Center/Surgery.

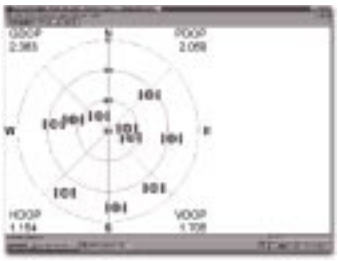
Supporting Agencies/Industry Participants: NIST, NLM, UMMS and CSC.

Neural Systems Laboratory

2202 A.V. Williams Building
Director: Dr. Shihab Shamma

The Neural Systems Laboratory performs theoretical and experimental research into the processing and recognition of complex sounds and speech in the auditory system. The various projects include: the development of computational models of neural networks for various early auditory and perceptual tasks; physiological investigations of the functional organization of the auditory cortex; and the development of VLSI-based hardware and signal processing software for the acquisition and analysis of multichannel sensory data.

Major Equipment: Sun HP and MacIntosh workstations; sound recording and generation sound booths; VLSI testing stations.



Pictured: *(Left) Graduate student Babak Azimi-Sadjadi, who is conducting research in Global Positioning System (GPS) Aided Navigation. The GPS system is part of the Intelligent Servosystems Laboratory, which is also affiliated with the Institute for Systems Research. (Below) GPS software screen-shot of the coordinates for the University of Maryland.*

Participating Faculty: Drs. J. Baras, S. Marcus, W. Levine, A. Makowski, P. S. Krishnaprasad, P. Narayan, M. Peckerar.

Affiliation: EE, ISR

Supporting Agencies/Industry Participants: AFSOR, Apple Computer, Inc., Hewlett Packard, ONR, NIH, NSF, NRL, Whitaker Foundation.

Software Engineering for Real-Time Systems (SERTS) Laboratory

1426 A.V. Williams Building
Director: Dr. David Stewart

The goal of the SERTS laboratory is to investigate new ways to design, implement, analyze, test, and debug embedded real-time software. Research projects include: component-based software modelling of dynamically reconfigurable embedded systems; automated performance monitoring and analysis; real-time error detection and handling; advanced technology for real-time operating systems; executives for non-preemptive microcontrollers and digital signal processors; a software framework for cooperative agents; and CASE tools to aid in reducing development time and cost of creating applications.

Major Equipment: Computing hardware includes 2 multiprocessor SPARCstations, three UltraSPARCs; four Intel-based personal computers, a dual-processor 68030-based VMEbus system, embedded processor development environments and evaluation kits for the following processors: 8086, 80286, 80386, 80486, V40, Z180, MC6805, MC6808, MC6812, MCORE, TMS320C30 and TMS320C54. Embedded system testbeds include a Puma 260 table-top robotic manipulator, computer-controlled pinball machine, computer controlled electric trains, camera and microphone for multimedia, and a home-automation system setup. Miscellaneous equipment includes a three logic analyzers, a digitizing oscilloscope, and a set of workshop tools for building and maintaining embedded system testbeds.

Affiliation: EE, UMIACS
Web Site: http://www.ee.umd.edu/serts
Supporting Agencies/Industry Participants: Pulse Electronics, Telogy Networks.

Systems Integration Laboratory

2250 A.V. Williams Building
Director: Dr. John Baras

The Systems Engineering and Integration Laboratory performs research on systems integration and vertical systems engineering, undertaking the merging of sophisticated control and

communication systems methodologies, such as: large-scale optimization; nonlinear and stochastic estimation and control; algebraic and differential geometric methods; scheduling, with computer-science methodologies from database management, search and planning algorithms; symbolic computation; object-oriented programming; and massively parallel architectures. Research on the modeling of complex systems investigates hierarchical modeling at different levels of detail, linking the physical modeling layer to the abstract layer, model-based automation and sensing, and on-line model construction with controlled complexity. Major on-going projects include network management, network modeling and performance evaluation, speech recognition, image recognition, telemedicine systems engineering, satellite constellations systems engineering, integrated product and process design, middleware systems, intelligent control architectures, design of intelligent materials, Internet modifications and advanced techniques, network traffic modeling and monitoring, learning systems.

Participating Faculty: Drs. M. Austin, S. Corson, J. Hendler, A. Makowski, S. Marcus, P. Narayan.

Affiliation: EE, ISR

Supporting Agencies/Industry Participants: NSF, AT&T, Lockheed Martin Telecommunications, Motorola, IBM, Hewlett Packard, Mil3, Lockheed Martin Corp., Boeing, Texas Instruments, Hughes Network Systems, Northrop Grumman, Semiconductor Research Corporation, NSF, AFOSR, ONR, ARO, NASA, NRL, NIST, NIH.

Electronic Sciences and Devices

Bioelectromagnetics Laboratory

2352 A.V. Williams Building
Director: Dr. Leonard S. Taylor

Research in the Bioelectromagnetics Laboratory includes studies of the dielectric properties of biomaterials,

Pictured: A binaural head mounted on a robotic vehicle. The head, created as part of the Learning and Intelligent Systems Learning Binaurally-Directed Movement project, senses sound and moves towards it. The goal of the research project is to investigate time coding in the central nervous system—specifically, the auditory system of the barn owl, and mimic the system in a robotic testbed. This research spans several laboratories, including the Intelligent Servosystems, Neural Systems and Carr laboratories at Maryland, and the Takahashi Laboratory at the University of Oregon. One potential application for this research includes video conferencing with "smart" camera motion. The vehicle shown was built during a summer school project at Telluride, Colorado, by a team led by Prof. Shihab Shamma.

biological tissues, and medical applications of microwaves. The open-probe technique is being used to study the dielectric properties of animal tissue to provide data for theoretical models of electromagnetic energy deposition in the human head during the use of a cellular phone.

Major Equipment: HP model 8510 Network Analyzer, HP workstation, PC, temperature-controlled bath, a range of microwave and coaxial components, microwave signal generators, S-band power generators.

Participating Faculty: Drs. C. C. Davis and E. C. Elson (Walter Reed Army Institue of Research).

Affiliation: EE

Supporting Agencies/Industry Participants: ONR, Wireless Technology Research Inc.

Electron Beam Physics Laboratory

0204A Energy Research Building
Director: Dr. Martin Reiser

The purpose and goals of this laboratory are to study the behavior and properties of high current beams with strong space-charge forces for advanced particle accelerator applications, such as high-energy physics colliders, heavy ion inertial fusion, nuclear waste transmutations and energy production, spallation neutron sources for material research, medical therapy, high-power microwave and free electron laser generation. The beam physics topics investigated so far include: multi-beamlet merging; emittance growth and halo formation due to mismatching or off-centering; longitudinal compression of rectangular and parabolic beam bunches; longitudinal energy spread of beams from thermionic sources; space-charge waves and instabilities; and relaxation processes towards thermal equilibrium.

A new major research project, aimed at the study of space-charge dominated beams in a circular system, has been approved and funded this year by the Department of Energy. The experimental facility, called "Electron Ring," has a circumference of about 11 meters and will be built during the next two years. It represents a novel and unique research tool for studying the beam physics in a ring configuration. Future experiments will provide important, currently unavailable data for theoretical modeling of space-charge dominated beams in such systems and for benchmarking computer simulation codes being used or developed in various laboratories.

Major Equipment: solenoid transport facility, resistive-wall instability facility, two electron guns producing 5-10 kV, 50-200 mA electron beams, various fast scopes, computer and data acquisition systems; new E-Ring facility under construction (see above).

Participating Faculty: Dr. J. G. Wang.

Affiliation: EE, IPR

Supporting Agencies/Industry Participants: DOE, FM Technologies, Inc.

Gyroklystron Laboratory

0204E Energy Research Building
Directors: Drs. Wesley Lawson and Victor Granatstein.

The main focus of this laboratory is the development of high-power microwave gyro-amplifiers. In the course of this main goal we also do developmental work related to high-power microwave components, such as electron guns, mode transducers, tapered waveguides, beam and microwave diagnostics, etc. The application of such RF sources is as drivers for linear electron colliders. In the past year we have set record peak power levels for conventional amplifiers with microsecond length pulses with a 3-cavity coaxial system that produced about 80 MW at 8.6 GHz.

Major Equipment: 2 Hz, 500 kV, 800 A, 1 microsec. modulator; hydrogen furnace; various microwave hardware, sources, test and measurement hardware.

Participating Faculty: Drs. M. Reiser, X. Xu, G. Nusinovich

Affiliation: EE, IPR

Supporting Agencies/Industry Participants: DOE, Stanford Linear Accelerator Center.

Harmonic Gyrotron Research Laboratory

0221 Energy Research Building
Director: Dr. Victor Granatstein

This laboratory studies the amplification of moderate power, millimeter-waves via the mechanism of coherent cyclotron radiation at harmonics of the electron cyclotron frequency. The work may lead to the development of more powerful amplifiers than are currently available in the frequency range near 95 GHz. Harmonic operation reduces the required magnetic field and may allow one to avoid the use of superconducting magnets. Potential applications include advanced radar and communication systems.

Pictured: *The pinball machine Comet Commander, created from scratch by students as part of a one-year, multidisciplinary design project sponsored by Lockheed Martin. The project director for the project was Dr. David B. Stewart.*

Major Equipment: 60 kV, 10 A, 1-10 microsec. soft-tube modulator; water cooled, 7 kG solenoid magnet with 8" bore, magnet power supplies, 17 GHz and 34 GHz microwave components, gyrotrons, magnetron injection guns.

Participating Faculty: Drs. H. Guo, M. Walter, G. Nusinovich, T. Antonsen, Jr.

Affiliation: EE, IPR

Supporting Agencies/Industry Participants: AFOSR, AF Phillips Lab., NRL.

High Power Microwave Generation Laboratory

0296 Energy Research Building
Director: Dr. Victor Granatstein

This laboratory studies the generation of high power microwave pulses using intense, relativistic, electron beams. Present studies concentrate on relativistic backward wave oscillators both under vacuum and plasma-filled conditions. Microwave pulse-shortening is a phenomenon of special interest. The aim is to understand processes that will lead to the generation of microwave pulses with energy in the 1-10 kJ range. The work is of special interest to the Department of Defense for the advanced concepts in electronic countermeasures.

Major Equipment: Dragon pulse-line accelerator (single shot, 100 ns pulse duration, 1 MV, 140 kA); line-type, high power modulator (650 kV, 800 A, 10 microsec. pulses with 350 kW average power); pulsed 15 kG solenoid; fast oscilloscopes; digitized data acquisition system.

Participating Faculty: Drs. Y. Carmel, T. Antonsen, Jr., G. Nusinovich, W. Destler, A. Shkvarunets, and Mr. J. Rodgers.

Affiliation: EE, IPR

Supporting Agencies/Industry Participants: AFOSR, AF Phillips Lab., ARL.

Intense Laser-Matter Interactions Laboratory

B0223, B0259 Computer and Space Sciences Building
Director: Dr. Howard Milchberg

The interaction of intense laser pulses with matter is of great interest for practical applications and basic research studies. The Intense Laser-Matter Interaction Laboratory develops and uses state-of-the-art laser systems that can produce ultrashort, ultra-intense pulses, up to $2x10^{18}$ watts/cm^2. One activity using these pulses is the production of intense, ultrashort x-ray pulses from laser-solid interaction for time-resolved material diagnostics. Another project is plasma fiber-optic guiding of relativistically intense laser pulses over long distances. This has application to the development of compact, tabletop 1 GeV electron accelerators, and sources of coherent short wavelength radiation–such as x-ray lasers and very high order frequency conversion.

Major Laser Equipment: 10Hz and 1000Hz Ti:Sapphire based chirped-pulse amplification laser systems (sub 100 fs pulses); 10 Hz Nd:YAG based

regenerative amplifier/power amplifier system (100 ps pulses); synchronously pumped dye oscillator/multi-stage amplifier system (subpicosecond pulses).

Participating Faculty: Dr. T. Antonsen

Affiliation: EE, IPST

Supporting Agencies/Industry Participants: NSF, AFOSR, NIST, DOE.

Laboratory for Atomic, Molecular, and Optical Science and Engineering

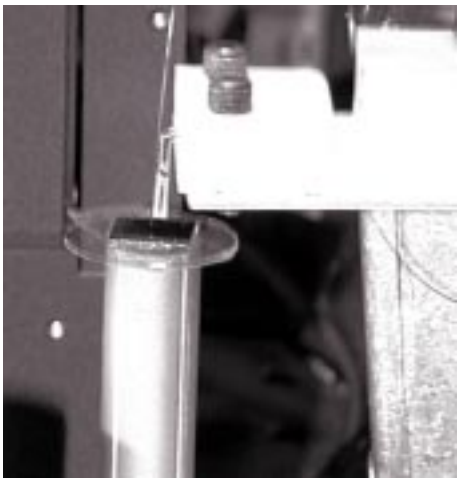
Computer and Space Sciences Building (Entire Lower Level)
Director: Dr. John Weiner

Atomic, molecular, and optical science (AMO) is a fertile area of research activity covering a broad domain of light-matter interactions. Faculty members from the departments of Physics, Chemistry, Engineering (EE), the Institute of Physical Science and Technology (IPST), and the Institute of Plasma Research (IPR) have organized themselves into LAMOSE, to provide a focal point for research and education in these multidisciplinary endeavors. LAMOSE is the natural home for faculty and students at all levels whose formal training may be in the traditional science or engineering disciplines but whose research pursuits lead them into basic and applied AMO science.

The laboratory has three principle objectives: graduate research in AMO science and engineering; graduate and undergraduate education; and partnership with industry, national laboratories, and other university centers.

Major Equipment: Coherent Ti:sapphire femtosecond laser oscillator and regenerative aplifier, optical parametirc aplifier; single frequency ring lasers, coherent picosecond dye lasers, 10 Hz 10 mj, 200 fs dye laser, 10 Hz 200 mj, 80 fs Ti:sapphire laser system, 1 Khz 1 mj, 100 fs Ti:sapphire laser system, 40 Ghz HP sampling oscilloscope.

Participating Faculty: Drs. J. Goldhar, P.-T. Ho, C. H. Lee, T. J. Mellrath, H. M.



Pictured: *A near-field scanning optical microscope examining a gold grating. The fibre tip is mounted onto a quartz crystal tuning fork. Beneath the sample is a piezo tube, which is used for distance control and two-dimensional scanning.*

Milchberg, F. Skiff, and J. Weiner.

Supporting Agencies/Industry Participants: Instituto de Física de São Carlos, Center for Ultrafast Optical Science at the University of Michigan, Centre de Physique Moleculaire Optique et Hertzienne at the University of Bordeaux, NIST.

Laboratory for Ion Beam Research and Applications

0202 Energy Research Building
Directors: Drs. John Melngailis and Jon Orloff

The work of the laboratory is centered on the generation of ion beams and their application to microfabrication. The program of research includes: new application of high resolution focused ion beams (FIB's) for electronic devices and for material science; high brightness gas field ion sources for these systems; ion beam induced chemical reactions; and projects in support of ion projection lithography for full chip exposure.

Major Equipment: a) Four focused ion beam (FIB) systems: a 50 keV system for beam induced chemistry, a 30 keV FIB/SEM system for high resolution milling and disposition, a 50 keV high resolution system for milling, etching, and deposition, and a 150 keV system for programmed high resolution implantation; b) a 300 keV ion implanter; c) ultra high vacuum system for gas field ionization source development; d) optical bench for electrostatic lens development e) lithography and microfabrication equipment including: e-beam evaporator, reactive ion etcher, atomic force microscope, very high resolution scanning electron microscope with EDAX, LMIS fabrication equipment, contact exposure system, and rapid thermal anneale

Participating Faculty: Drs. W. Destler, N. Goldsman, T. Venkatesan, S. Guharay, A. Iliadis, John T. Moore (Chem.) J. Bernstein, (Mat. Sci.) and R. Ramesh (Mat. Sci.)

Affiliation: EE, IPR

Supporting Agencies/Industry Participants: DOD/NSA, NSF, Navy, Intel and FEI Company.

Laser Sensor Laboratories

2316, 2320 A.V. Williams Building
Director: Dr. Christopher Davis

Research in the laser sensor laboratories covers a broad range of topics in the areas of fiber and free-space laser interferometry. Coherent, hybrid homodyne and heterodyne fiber sensors have been studied that can be used for remote measurement of electrical and magnetic fields, for mapping the birefringence patterns in GaAs and related electronic and photonic devices. Near-field scanning optical microscopy is being used in a new interferometric reflection mode to provide phase and amplitude contrast in imaging of semiconductor, dielectric, and biological samples with resolution on the order of 50 nm. Direct-write lithography in the ultraviolet wavelength using tapered optical fibers is being used for novel device and structure modification and characterization.

Major Equipment: 2 CW CO_2 lasers, several diode-pumped Nd:YAG and He-Ne lasers, pulsed Nd:YAG laser, five vibration isolated optical tables, Fabry-

Perot and various homodyne and heterodyne fiber interferometers, near-field scanning optical microscope, near-field direct-write lithography system, several optical microscopes, Sutter micropipette, Ericsson fusion splicer, anechoic chamber, various micro- and nano-positioning assemblies and alignment instruments, numerous signal and spectrum analyzers, lock-in amplifiers, signal generators, Sun SparcStation, HP workstations and PCs.

Participating Faculty: Drs. W. Atia, D. L. Mazzoni, S. Pilevar, I. I. Smolyaninov.

Affiliation: EE

Supporting Agencies/Industry Participants: NSA, ONR, NSF, ARL, Wireless Technology Research Inc., FDA, State of Maryland.

Magnetic and Semiconductor Simulation Laboratory

2348 A.V. Williams Building
Director: Dr. Issak Mayergoyz

In this laboratory we perform studies on hysteresis and viscosity modeling as well as modeling and simulation of semiconductor devices.

Major Equipment: Vibrating Sample Magnetometer with temperature control chambers and various computers.

Affiliation: EE, LPS

Supporting Agencies/Industry Participants: DOE, NSA, ARL and Intel.

Microwave Research Laboratory

2344 A.V. Williams Building
Director: Dr. Kawthar Zaki

In this laboratory accurate modeling techniques are developed for complex microwave transmission and resonant structures. These models are used in the development of miniaturized high quality microwave filters and multiplexers. We also develop very accurate measurement techniques for determining the dielectric constant and loss tangent of bulk and substrate materials. Modeling and characterization of dielectric resonators is performed for use in superconducting cavities in ultra low noise oscillators.

Pictured: *A scanning tunneling microscope, made in the Nanoelectronics Laboratory by Prof. Chia-Hung Yang's research group. This type of microscope resolves down to the atomic level, enabling Yang's group to probe the quantum nature of devices at the nanometer scale.*

Major Equipment: Sun workstations; Automatic Network Analyzer, 500 MHz-18 GHz; Spectrum Analyzer.

Affiliation: EE

Supporting Agencies/Industry Participants: Sandia National Lab., Antenna Specialist Co., Scientific Microwave Inc., K&L Microwave Inc.

Microwave Sintering Research Laboratory

0145 Energy Research Building
Director: Dr. Yuval Carmel

This laboratory studies the sintering of ceramics at a multiple of microwave frequencies either applied individually or simultaneously. The aim is to understand and optimize the microwave sintering process by using acoustic wave and microwave diagnostics. Eventually, ceramic materials with greatly improved mechanical properties may result. Potential applications include ceramic, internal combustion engines operating at high temperatures, and improved efficiency compared with metal engines.

Major Equipment: microwave furnace (4' x 2' dia. with changeable gaseous atmosphere); 3 kW average power, 2.45 GHz magnetron source; 1 kW average power 28 GHz klystron source; 1200 C furnace (3" dia. x 23" long); microwave vector network analyzer (1.5-20 GHz).

Participating Faculty: Drs. T. Antonsen, Jr., V. Granatstein, I. Lloyd.

Affiliation: EE, IPR, Materials and Nuclear Engineering

Supporting Agencies/Industry Participants: DOE, ARO, NATO, CPI (formerly Varian Microwave Power Tube Division).

Nanoelectronics Research Laboratory

1322, 2358, 2364, 1316 A.V. Williams Bldg.
Director: Dr. Chia-Hung Yang

The Nanoelectronics Research Laboratory consists of five facilities in the department. The focus of this research laboratory is to investigate the electronic properties of nanometer-scale devices, with an emphasis on transistors for VLSI applications. The building block of today's VLSI circuits is the transistor, and by downscaling the transistor's lateral dimension we can increase the complexity and functionality of integrated circuits. Such scaling approach has a physical limit of approximately 0.1 micrometers: when transistors are less than 0.1 micrometers in size they stop working as three-terminal switches. Our goal is to invent and apply new transistors that can be much smaller. Recently, two structures based on quantum mechanical tunneling have been invented and reported by Prof. Yang's group.

A variety of equipment and methods are employed: The first facility features a Molecular Beam Epitaxy (MBE) system, for research in the area of quantum transistors. MBE machines allow for the growth of heterojunctions with precise control over one atomic layer, and layers (each nanometers in thickness) can produce strong quantum effects in electron transport even at room temperature. The system will be

used specifically for the growth of device-quality silicon, germanium, and silicides on silicon.

The second facility contains a new electron-beam lithography system, which consists of a scanning electron microscope and a computer-controlled electron-beam steering system. By using a tightly-focused electron beam to directly expose an electron-sensitive resist, a fine pattern nanometers in dimension can be defined on the resist. The pattern can later be transferred to the sample by other clean room processes for manufacturing useful devices.

The third facility is for electrical characterization. We use Magnetotransport cryostats with superconducting magnets to characterize electronic devices at 0.3K $< T <$ 300K. Both analog and digital data acquisition systems are available.

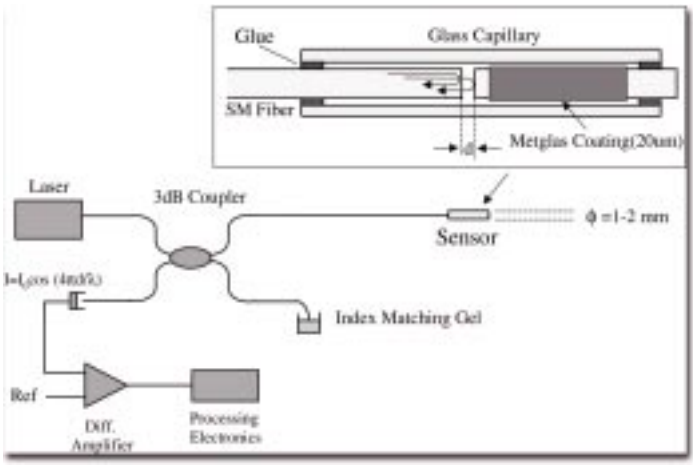
The fourth facility features optical characterization systems, including an argon ion laser; an ion laser-pumped dye laser; a 100 W carbon dioxide laser (infrared); a single-pass 0.8 meter Spex spectrometer; a continuous-flow liquid helium cryostat; and a PC-controlled photon counting detector.

The last facility utilizes scanning tunneling microscopes to characterize nanometer-scale electronic devices. We perform scanning tunneling microscopy on nanostructures at variable temperatures, with 0.1 angstrom spatial resolution.

Major Equipment: EPI molecular beam epitaxy, Omicron UHV scanning tunneling microscope, JEOL 40keV scanning electron microscope, Coherent argon laser, Coherent dye laser, Kinetics CO2 laser, Spex spectrometer, Janis continuous flow cryostat, magnetoresistance system with magnetic field strength up to 9 tesla and 0.3K $< T <$ 300K, automated current-voltage characterization system (HP4142B), gain phase/impedance analyzer from 100Hz to 40MHz, SUN Sparcstations and PCs.

Affiliation: EE

Pictured: *a Fiber Optic EFPI Magnetic Field Sensor, used to measure small magnetic fields. Such devices could be used in geological applications such as the detection of the earth's magnetic field perturbations. The sensor is being developed in the Laser Sensor Laboratories, by graduate student Rafael Rojas.*



Supporting Agencies/Industry Participants: LPS/NSA and Arpa.

Participating Faculty: P. T. Ho, and Chris Davis.

Photonic Switching and Integrated Optoelectronics Laboratory

1155, 1203, 1205 Engineering Laboratory Building
Director: Dr. Mario Dagenais

Research in this laboratory spans a wide range of topics in the field of integrated optoelectronics, including: semiconductor lasers and amplifiers; integrated receivers; optoelectronic interconnects and packaging; wavelength conversion devices; optical bistability; semiconductor laser reliability studies and laser theory and modeling; and implementation of a WDM network to study distributed shared memory computing.

Major Equipment: Anritsu Bit-Error-Rate Tester, HP electronic and optical spectrum analyzer, e-beam evaporator, spectrometer, signal generator, power supplies, Coherent Ar ion laser, Coherent Ti:Sapphire laser, optical and electronic equipment for characterization of semiconductor lasers and amplifiers, optical fibers, computers.

Participating Faculty: Dr. Y. J. Chen (UMBC).

Affiliation: EE, UMIACS

Supporting Agencies/Industry Participants: NASA, NSA, AFOSR, NSF, Hewlett-Packard, Micracor, New Focus, TRW, Coherent, Uniphase, COMSAT, Fermionics, AMP, United Technologies.

Photonics Laboratory

4456 A.V. Williams Building
Director: Dr. Ping-Tong Ho

The various projects examined in this laboratory include: (1) Laser Ranger–using a laser to measure distance; (2) design and fabrication of optical standards; (3) design and fabrication of optical spatial light modulators; and (4) design and fabrication of optical channel dropping filters.

Major Equipment: Nitrogen Laser/amplifier system; a microelectronics inspection/measurement station; thermal evaporator; workstation and PC; standard optical equipment; microwave signal source and measurement equipment; high-voltage equipment.

Affiliation: EE

Supporting Agencies/Industry Participants: Automated Precision, Inc., NSF, DoD.

Semiconductor Device, Materials and Circuits Simulation Laboratory

2333 A.V. Williams Building
Co-Directors: Drs. Jeffrey Frey and Neil Goldsman

Projects include the development of advanced CAD tools for the design and detailed analysis of VLSI-scale silicon and other semiconductor devices, materials and circuits used in communications and computing.

Major Equipment: 6 workstations, a PC, and various associated equipment.

Participating Faculty: Dr. Isaak Mayergoyz

Affiliation: EE

Supporting Agencies/Industry Participants: DEC, LSI Logic, Intel, SRC Industry Consortium, NSF, LPS, MRL, ARL, NRL, NSA

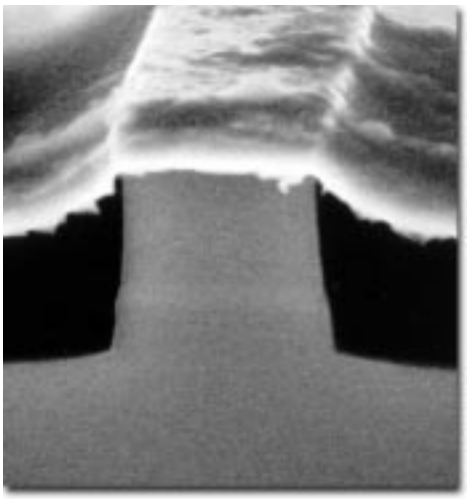
Thin Films and Device Applications Laboratory

Center for Superconductivity Research, Physics Department, NSF, MRSEC on Oxide Thin Films, Surfaces and Probes
Director: Dr. T. Venkatesan

The following projects being investigated include: (1) pulsed laser deposition of multi-component oxide films; (2) low temperature transport measurements; (3) surface analysis by X-ray diffraction and Rutherford backscattering analysis; (4) multi-component Oxides and Nitrides, for high Temperature Superconductivity, Magnetism and wide bandgap semiconductors.

Major Equipment: 2 Excimer Lasers; 8 Pulsed Laser Thin Film Deposition Systems; 6 transport measurement systems; Accelerator (1-7 Mev) Tandem; RBS system; X-ray Diffractometers; Atomic Force Microscope, spectro-photometer, ion milling station, wire bonder and high field magnets, photoluminiscence measurement facility.

Affiliation: EE, Physics



Pictured: A photograph of a three micron wide (about 66 times smaller than the average human hair) waveguide modulator, taken using a scanning electron microscope, which is capable of magnifying the image 50,000 times. Such devices are important for increasing the performance of the internet, where the quest for ever higher data transfer rates necesitates the need to modulate a light signal billions of times a second. The small size is essential, since these modulators must be coupled directly to fiber optic lines–the backbone of the internet–which themselves are only ten microns across. This research is being conducted in the Photonic Switching and Integrated Optoelectronics Laboratory

Supporting Agencies/Industry Participants: NRL, DARPA, NSF, ONR, Rockwell/ Boeing, Army

Ultrafast Optoelectronics Laboratory

4448, 4452 A.V. Williams Building
Director: Dr. Chi H. Lee

The following is a list of the topics studied in this laboratory: (1) on-wafer sampling of high speed and high frequency electronic devices and circuits; (2) ultrafast electronics using high temperature superconductor photoresistive switches; (3) ultra-wideband radiation for radar and wireless communications; (4) pulse power; (5) high power ultrafast semiconductor lasers; (6) micro-wave photonics; (7) diode pumped hybrid lasers for ultrashort pulse generation; (8) terahertz radiation; and (9) soliton propagation and interaction in optical fiber.

Major Equipment: Femtosecond Ti:Sapphire laser, regenerative amplifier and optical parametric amplifier in LAMOSE lab;CW mode-locked Nd:glass system including oscillator, two stage regenerative amplifier; terahertz radiation experimental setup; optoelectronic based ultra-wideband wireless communications system; optoelectronic sampling system; femto-second streak camera; high speed oscilloscopes; various ultrafast semiconductor lasers; laser wafer probe station; diode pumped CW mode-locked Nd:YLF oscillator and regenerative amplifier system; Coherent Antares CW mode-locked Nd:YLF lasers; Spectra-Physics Argon Ion Laser.

Participating Faculty: Dr. W.-L. Cao, Dr. E. Funk and Dr. K. J. Lee

Affiliation: EE, LPS, ARL, LAMOSE

Supporting Agencies/Industry Participants: NSA, ARL, ONR, COMSAT, Cree Research, Germanium Power Devices Corp., DuPont.

Contracts and Grants

During 1997-98, total grants in force which Electrical Engineering faculty were Principal Investigators for amounted to $128,913,349. Actual research expenditures for 1997-98 were as follows:

Federal Government	$20,914,049
Business and Industry	$3,488,674
State of Maryland	$3,042,716
Total	$27,445,439

Of this total, $10,136,883 was administered by the Department of Electrical Engineering, $8,080,823 was administered by the Institute for Systems Research, $5,230,302 was administered by the Institute for Plasma Research, $391,325 was administered by the Institute for Physical Science and Technology, $155,666 was administered by the Center for Superconductivity, and $3,450,440 was administered by the University of Maryland Institute for Advanced Computer Studies.

In total, 51 of our full-time faculty were engaged in sponsored research during the 1997-98 academic year.

A significant portion of the research grants obtained by faculty was in the form of major block grants, involving several faculty members and focusing on cross-disciplinary research. Some of the block grants representing areas of significant research activity are listed below.

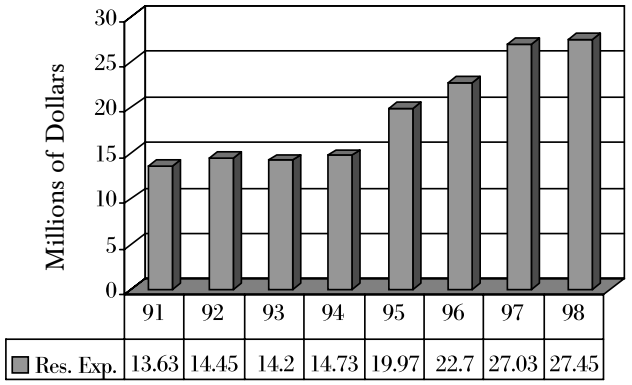
- **Information Sciences and Systems:** NASA Center for Satellite and Hybrid Communications; DoD funded initiative in automated vision/ sending; two Army Research Laboratory Federated Labs in Advanced Communications and Information Distribution and in Advanced Sensors; DoD-funded Nonlinear Active Control of Dynamical Systems; DoD-funded Advanced Acoustics and Auditory Processing Center; and DoD-funded Design and Control of Smart Structures.
- **Electronic Sciences and Devices:** DoE-funded Accelerator Research Program; NSA-funded Supercomputer Optical Interconnects; NSA-funded Joint Program for Advanced Electronic Materials; DoD-funded Laboratory for Ion Beam Research and Applications; DoD-funded High Power Microwave Sources; NSF industry-funded Industry/ University Cooperative Research Center in Optoelectronic Devices, Interconnects and Packaging; and the Army Research Laboratory Microelectronics Research Center.

Figure 12 summarizes the history of the Department's research expenditures over the past eight years.

Figure 13 shows the 1997-98 Research Expenditures by source. Tthe history of research expenditures by source is summarized in Fig. 14.

An itemized list of the current contracts and grants in force is provided in the pages that follow.

Fig. 12. Research Expenditures History



	91	92	93	94	95	96	97	98
Res. Exp.	13.63	14.45	14.2	14.73	19.97	22.7	27.03	27.45

Fig. 13. Annual Research Expenditures by Source

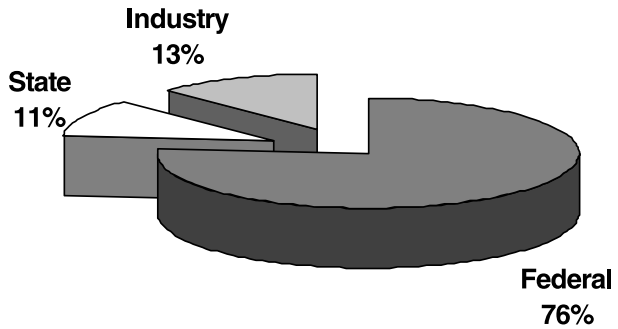
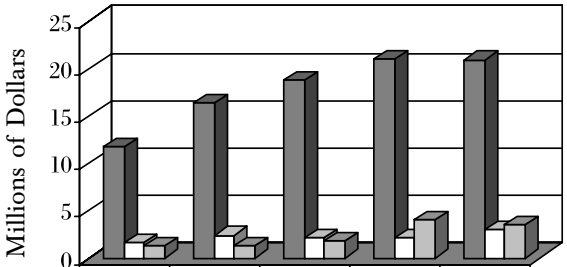


Fig. 14. Annual Research Expenditures by Source



	94	95	96	97	98
Federal	11.76	16.38	18.78	20.93	20.91
State	1.63	2.37	2.14	2.09	3.04
Industry	1.29	1.21	1.84	4.01	3.49

Contracts and Grants

Note: *Contacts and grants with multiple principal investigators are repeated under each principal investigator's name.*

Project Title	Funding Source	Amount
Abed, Eyad		
Active Stall Control Multistage Compression Systems	AFOSR	$309,484
Nonlinear Active Control of Dynamical Systems	VPI	$700,000
Antonsen, Thomas		
Advanced Vacuum Electronic Microwave Devices	NRL	$680,616
Application of Plasma Waveguides to Advanced High Energy	DOE	$108,400
Basic Studies of High Power Millimeter Wave Amplifiers and Associated Technology	NRL	$350,000
Maryland Controlled Fusion Research Program	DOE	$1,626,568
Microwave Generation for Magnetic Fusion Energy Applications Task A	DOE	$352,000
Microwave Generation for Magnetic Fusion Energy Applications Task B	DOE	$352,000
Research on Compact, High-Engery, Microwave Sources	Air Force	$3,611,271
Ultra-Intense Laser Pulse Propagation of Gas and Plasma	NSF	$134,000
Baras, John		
Advanced Telecommunications/Information Distribution	Lockheed Sanders	$3,157,686
Center for Satellite & Hybrid Communications Networks	NASA	$1,283,000
Commercial Satellite Systems for High Data Rate	NASA	$350,000
Cortical Representation of Acoustics Spectra	NSF	$99,873
Design of Bi-lateral, Satellite Optimized, TCP/IP	Lockheed	$124,825
Efficient Network Data Storage & Retrieval for Integrated Network Management	Lockheed	$59,264
Integrated Product & Process Design Automation Tool	MIPS/Westinghouse	$155,532
Network Resources Management for Mobile ATM	Boeing	$50,000
Theoretical Foundations and Tools for Concurrent Eng. for Run-to-Run Ctrl. in Semicond. Mfg.	SRC	$102,000
Terrestrial Wireless Extensions of Direct Broadcast	MIPS/Hughes	$214, 082
Wireless and Hybrid Networks Laboratory	ONR	$200,377
Bhattacharyya, Shuvra		
Software Synthesis for Real-time Signal Processing	NSF	$200,000
Blankenship, Gilmer		
Fault Detection in Bearings	MIPS/Beth Steel	$160,119
Optimal Management of Sensor System	MIPS/Atl. Aerospace	$76,931
Chellappa. Rama		
Advanced Automatic Target Recognition	AIR FORCE	$91,000
Advanced Sensors Studies	Lockheed/Sanders	$1,041,520
Appearance-Based Vision for Complex Environments	DARPA	$104,040
Classification of Non Cooperating Targets Using Multiscale Stochastic Models	AIR FORCE	$104,000
Context-Based Temporal Reasoning & Analysis of Vehicule Activities from SAREO Imagery	DARPA	$600,000
Model-Based Recognition of Targets in Foliage-Pentrating SAR Images	ARMY	$140,138
Model Supported Positioning of Synthetic Aperture Radar	ARMY	$104,040
Dagenais, Mario		
The Alliance of WDM Laser Array Application	AIR FORCE	$2,380,494
Antireflection Coating of High CW Power 1.5-1.6 μm Eye Diode Lasers	Sensors Unlimited	$20,000
Center for Optoelectronic Devices, Interconnects, and Packaging	NSF	$520,000
Design and Fabrication of Semiconductor Microactivities	IMRA CORP.	$25,000
Distributed Shared Memory Computing Using an Optical Backbone	NSA	$5,215,579
Fiber Optic Lens for Antenna Arrays	MIPS/Xenotran	$36,867
Flip Chip Bonding of Optoelectronic Circuits & Modules	Digital Optics Corp.	$12,500
High Power Optical Laser Switch	AlliedSignal	$25,000
Joint Program for Advanced Electronic Materials	NSA	$937,453

Contracts and Grants

Project Title	Funding Source	Amount
MOSAIC Optoelectronic Packaging	TRW	$79,634
Optoelectronic Packaging of VCSEL Arrays	VIXEL	$25,000
Semiconductor Manufacturing	NIST	$9,100
Spectral Processing on Wavelength Encoded Signals in Semiconductor Laser AMPS	AIR FORCE	$196,579
Davis, Christopher		
Advanced Fiber Optic Sensors and Free Space Optical Data	NSA	$399,343
Analysis of Optically-Pumped Lasers, Solid State Lasers	BATTELLE	$22,500
Fiber Optic Biosensors	CAB, INC.	$19,000
Gemstone Program: An Interdisciplinary Undergraduate Program	NSF	$103,937
Gene Expression Following 60 Hz EMF Exposure	STMD/UMAB	$16,181
Instrumentation for Ultrahigh Resolution Temporal and Spatial Studies	ARMY	$88,000
Molecular Effects of ELF Fields with Harmonic Content	STMD/UMAB	$6,237
Novel Studies of Surface Plasmons and their Applications	US Civil. Res. Fd.	$12,000
DeClaris, Nicholas		
Exploratory Research on Machine Reasoning for Concept	NIST	$82,784
Destler, William		
Advanced Vacuum Electronic Microwave Devices	NRL	$680,616
Center of Excellence for Ion Beam Research and Applications	NSA	$969,124
Center for Strategic Man-Made Materials	GSA	$31,416
Research on Compact, High-Energy, Microwave Sources	AIR FORCE	$3,611,271
Gemstone Program: An Interdisciplinary Undergraduate Program	NSF	$103,937
High Indium Low Cost FET Materials for MMJCs	Lockheed Martin	$35,000
Hybrid Plasma Microwave Tubes for High Technology Applications	NATO	$30,900
Increased Optical Cross Section Using CQWS	Lockheed Sanders	$109,738
MAFET Quasi-Optic Monolithic Amplifiers	Lockheed	$139,047
Microelectronics Research Collaborative Program	ARL	$9,196,712
Microwave Generation for Magnetic Fusion Energy Applications- Task A	DOE	$352,000
Microwave Generation for Magnetic Fusion Energy Applications- Task B	DOE	$352,000
Polarization Sensitive QWIP Thermal Imager	Digital	$58,851
Research in Lasers and Beams	NRL	$1,112,342
Two-Color Material and Detector Development	Lockheed Sanders	$84,976
Ephremides, Anthony		
Advanced Telecommunications/Information Distribution	Lockheed/Sanders	$3,157,686
Algorithms for Optimization of Cellular Networks	GTE	$20,000
Center for Satellite & Hybrid Communication Networks	NASA	$1,283,000
Digital Wireless Reliability Study	MIPS/Tektron	$56,300
Performance Trade-Offs in All-Wireless Networks	NAVY	$40,000
Farvardin, Nariman		
Advanced Telecommunications/Information Distribution	Lockheed/Sanders	$3,157,686
Channel Coding Problems Associated with the Transmission	NSF	$325,214
Fast, High Performance Still Image Compression	Intel	$150,327
Fiber Optic Communications	NSA	$248,779
Indoor Wireless Project	NSF	$399,986
Prototype Software Development for Telemedicine	BIRCH/DAVIS	$10,697
Research in Optics & Optoelectronics	NSA	$105,000
Research Internships in Telecommunications Engineering	NSF	$136,920
Research Support Contract	NSA	$96,234
Specialized Optical Sources for Advanced Fiber Optic Communications	NSA	$1,506,165
Fuja, Thomas		
Error Correction R & D Applicable to Vocoders	NSA	$100,000
Intergovernmental Personnel Agreement	NSF	$131,637

Contracts and Grants

Project Title	Funding Source	Amount
Young Scholars Program	NSF	$104,494
Geraniotis, Evaggelos		
Center fot Satellite & Hybrid Communication Networks	NASA	$1,283,000
Non-Gaussian Multi-Sensor Signal Processing & Exploitation of Wideband Signals	NAVY	$215,527
DS/CDMA for High Data Rate SATCOM Naval Communication	NAVY	$120,000
Modulation and Coding Techniques for Atmospheric & Underwater Communication	NAVY	$616,085
Collaborative Research on Feasibilty Study	Telesystems	$30,000
Design and Evaluation of 3rd Generation Wireless DS/CDMA Systems	Hughes	$30,000
Power Control in a High Speed Wireless Network Architecture for Indoor Portable Communications	Phillips	$40,000
Gligor, Virgil		
Certificate Management Infrastructure-Certificate Revocation	STMD	$168,500
Goldhar, Julius		
Research in Lasers and Beams	NRL	$1,112,342
Technology & Techniques for Optical Communications	NSA	$2,111,185
Laser System for Research in Atomic, Molecular and Optical Sci. and Eng.	NSF	$553,267
Goldsman, Neil		
Collaborative Research Between UMD and TCAD	LSI Corp	$30,000
Devices and Circuits by Focused Ion Beam Implementation Tech. Dev.	NSA	$500,000
Semiconductor Device Modeling	NSF	$344,721
Focused Ion Beam Implanted Transistors for Integrated	NSA	$247,437
Gomez, Romel		
Giant Magnetoresistance of Multilayer Films	NIST	$167,920
Preparation and Investigations of Giant Magnetoresistance Effect Sensors	NIST	$75,313
Evaluation of the Effects of Vapor Phase Corrosion	NAVY	$18,496
Atomic Microscopy and Surface Science	NSA	$149,921
Dev. of Ultra-High Volume Magnetic Force Microscope & Magnetic Force Scanning Tunneling Microscope	ARMY	$80,000
Magnetic Disk Remanence	NSA	$1,169,998
X-Ray Diffraction Invest. of Magnetic Multilayers Exhibiting the Giant Magnetoresistance Effect	NIST	$99,784
Granatstein, Victor		
1998 Advanced Accelerator Concepts Workshop	DOE	$80,000
Accelerator Research Study- Task C	DOE	$3,710,000
Advanced Vacuum Electronic Microwave Devices	NRL	$680,616
Basic Studies of High Power Millimeter Wave Amplifiers and Associated Technology	NRL	$350,000
High Resolution Diagnostics for High Power Microwave Generation Research	AIR FORCE	$323,000
Indoor Wireless Project	NSF	$399,986
Microwave Generation for Magnetic Fusion Energy Applications- Task A	DOE	$354,000
Microwave Generation for Magnetic Fusion Energy Applications- Task B	DOE	$352,000
Optical Fiber Based Muzzle Reference System	MIPS/RSI Corp.	$55,000
Research in Lasers and Beams	NRL	$1,112,342
Research on Compact, High-Energy, Microwave Sources	AIR FORCE	$3,611,271
Studies of Plasma Loaded Backward Wave Oscillators	AIR FORCE	$173,550
Ho, Ping-Tong		
Joint Program for Advanced Electronic Materials	NSA	$86,193
Laser System for Research in Atomic, Molecular and Optical Science and Engineering	NSF	$553,267
Low Cost Industrial Laser Ranger	MIPS/Auto Pres	$104,908
Nanometric Fabrication for Near Field Microscopy Standards	NIST	$21,089

Contracts and Grants

Project Title	Funding Source	Amount
Optical Dropping Filters	NSA	$250,000
Iliadis, Agis		
Development of Light Emitting Devices in Wide Band Gap Metal Oxide/Nitride Systems	NSF	$62,237
Development of Si Light Emitting Devices for Enabling Optical Interconnect Technology	NSF	$150,000
Development of CMOS Compatible Si Light Emitters for Optical Interconnect Tech.	NSA	$173,426
Ja?Ja?, Joseph		
Acquisition of an ATM Network	NSF	$390,276
Advanced Ctr. For Global Remote Sensing Studies	NASA	$430,000
Connecting the Univ. of Maryland to vBNS	NSF	$350,000
Designing Practical Parallel Algorithms for Computing and Image Processing	NSF	$181,899
High Performance Computing for Remote Sensing Application	NSF	$46,200
NPAIC - San Diego	NPAIC	$66,500
Performance & Mgmt. Of Distributed Heterogeneous Networks	NSA	$944,382
Krishnaprasad, P. S.		
Learning Binaurally Directed Movement	NSF	$775,000
Mathematics of Controllable Physical Structures	Harvard	$527,350
Supplement to ERC in Systems Research	NSF	$550,000
Lawson, Wes		
Accelerator Research Study- Task C	DOE	$3,710,000
Advanced Vacuum Electronic Microwave Devices	NRL	$680,616
Basic Studies of High Power Millimeter Wave Amplifiers and Associated Tech.	NRL	$350,000
Research Internships in Telecommunications Engineering	NSF	$136,920
Lee, Chi		
Dev. of Ultra-High Volume Magnetic Force Microscope & Magnetic Force Scanning Tunneling Microscope	ARMY	$80,000
High Resistivity Photoconductive InGaAiAs Photodetector	NSA	$390,000
Invest. and Ctrl. of Photo-Chemical Dynamics Using Specially Modulated Ultrafast Laser Pulses	NAVY	$48,032
Joint Program for Advanced Electronic Materials	NSA	$5,324,950
Laser System for Research in Atomic, Molecular and Optical Science and Engineering	NSF	$553,267
Optical Controlled HTS Switches for Telecommunication	Dupont	$37,969
Short Pulse Communications Research	NSA	$200,000
Levine, William		
Further Development Support and Enhancement	NASA	$120,013
Model Based Interpolation of Ultrasound Scans of the Tongue	UMAB	$81,748
Liu, K. J. Ray		
Algorithm-Based Architectural Low-Power Design Method	NAVY	$289,726
Multimedia Video on Demand	Microstar	$112,031
Novel Approaches For Modern Signal Processing	NAVY	$94,480
Novel Approaches for Numerical Signal Processing	NSF	$99,985
Optimization of Multi-Dimensional NMR Data	NIH	$300,077
Young Investigator Award-High Performance Computing	NSF	$212,500
Makowsi, Armand		
Center for Satellite & Hybrid Communication Networks	NASA	$1,283,000
Marcus, Steven		
Institute for Systems Research	NSF	$4,237,187
Integrated Hierarchical Life Cycle Approach to the Design and Operation of a Semiconductor Fabrication Factory	NSF	$267,000
Integrated Hierarchical Life Cycle Approach to Design	SRC	$133,000

Contracts and Grants

Project Title	Funding Source	Amount
Learning Binaurally Directed Movement	NSF	$775,000
Semiconductor Device Modeling	NSF	$344,721
Mayergoyz, Isaak		
Atomic Microscopy and Surface Science	NSA	$779,641
Magnetic Disk Remanence	NSA	$1,169,998
Mathematical Models of Hysteresis	DOE	$312,160
Melngailis, John		
Collaborative Work on Dev. of Processes for Creating Ultra-high Speed Integrated Circuit Tech.	NRL	$28,000
Devices and Circuits by Focused Ion Beam Implementation Technology Development	NSA	$500,000
Focused Ion Beam Implanted Transistors for Integrated Circuits	NSA	$247,437
US/Japan Joint Seminar: Formation of Ion Nanobeams and Application to Material Processing	NSF	$20,690
Miilchberg, Howard		
Application of Plasma Waveguides to Advanced High Energy	DOE	$108,400
Laser System for Research in Atomic, Molecular and Optical Science and Engineering	NSF	$553,267
Ultra-Intense Laser Pulse Propagation of Gas and Plasma	NSF	$134,000
Milor, Linda		
Statistical Modeling Methodology for Submicron MOS Devices and Circuits	NSF	$145,000
Nakajima, Kazuo		
Advanced Thin Ionization Calorimeter Balloon Experiment	NAVY	$30,518
Narayan, Prakash		
Center for Satellite & Hybrid Communication Networks	NASA	$1,283,000
Newcomb, Robert		
Devices and Circuits by Focused Ion Beam Implementation Technology Development	NSA	$500,000
Orloff, Jon		
Dev. of a Cs Electrohydrodynamic Ion Source for High Spatial Resolutions Secondary Ion Mass Spectrometery	NSF	$159,692
Devices and Circuits by Focused Ion Beam Implementation Technology Development	NSA	$500,000
US/Japan Joint Seminar: Formation of Ion Nanobeams and Application to Material Processing	NSF	$20,690
Oruc, Yavuz		
High Speed Nonblocking Switching Networks	NSF	$277,700
Ott, Edward		
Chaos Theory Applied to Communication	NSF	$24,630
Chaotic Dynamics of Physical Systems	ONR	$378,000
Fractal Structure of Fluid Vorticity and Blowout Bifurcations	ONR	$82,039
Maryland Controlled Fusion Research Program	DOE	$1,626,568
Research in Lasers and Beams	NRL	$1,112,342
Papamarcou, Adrian		
Indoor Wireless Project	NSF	$399,986
Research Internships in Telecommunications Engineering	NSF	$136,920
Peckerar, Martin		
Devices and Circuits by Focused Ion Beam Implementation Tech. Dev.	NSA	$500,000
Ramaswamy. Alba Lalitha		
Development of Aerial Vehicle Microprocessor Control	NAVY	$17,260
Engineering Studies/Support on Flexible Linear Shaped Charges	NAVY	$48,396
Study & Optimization of Laser Initiated Detonators	NAVY	$49,084
Study of "Ammonium Dinitramide" (A D N) Utilized in Propellants	NAVY	$95,280
The Continuation of Eng. Studies/Support on Laser, Elect. Detonators and Explosive Devices	NAVY	$49,897

Contracts and Grants

Project Title	Funding Source	Amount
Reiser, Martin		
Accelerator Research Study- Task C	DOE	$3,710,000
Accelerator Research Study- Task A	DOE	$2,092,584
Studies of Longitudinal Instability with an Electron Beam	DOE	$865,399
Rosenfeld, Azriel		
Advanced Sensors Studies	Lockheed/Sanders	$1,041,520
Apperance-Based Vision for Complex Environments	DARPA	$104,040
Context-Based Temporal Reasoning & Analysis of Vehicule Activities from SAREO Imagery	DARPA	$600,000
Shamma, Shihab		
Annual Telluride Workshop on Neuromorphic Engineering	ONR	$10,000
Center for Auditory and Acoustics Research	ONR	$1,829,058
Cotrical Representation of Acoustic Spectra	NSF	$99,873
Learning Binaurally Directed Movement	NSF	$775,000
Math Models for Process & Recognition	ONR	$667,246
Shayman, Mark		
Research Experiences for Undergraduates	NSF	$102,500
Supervisory Control Design for Nondeterministic System	NSF	$150,000
Tassiulas, Leandros		
Algorithms for Optimization of Cellular Networks	GTE	$20,000
Efficient Wireless Access and Mobility Support	AIR FORCE	$63,062
Hand-over Diversity Analysis of the ICO Satellite Network	Hughes	$42,522
Indoor Wireless Project	NSF	$399,986
Localized Congestion Control Strategies for Network-Wide Performance Guarantees	NSF	$198,403
Mobile Network Architectures & Protocols for Reliable Info. Transport in Dynamic Environ.	ONR	$160,000
Network Resources Management for Mobile ATM	Boeing	$50,000
Power Control, Hand Off & Coverage Studies in a High Speed Wireless Network Architecture for Indoor Portable Comm.	Phillips	$40,000
Research Problems in Wireless Communication Systems	AIR FORCE	$129,129
Wireless Access Control for Optimal Spectral Efficiency	NSF	$140,000
Wireless and Hybrid Networks Laboratory	ONR	$200,377
Tits, Andre		
Optimization Techniques for Problems Arising in Design and Other Eng. Applications	NSF	$273,331
Tretter, Steven		
Communication Functions for DSP	MIPS/Digital Technics	$38,894
Indoor Wireless Project	NSF	$399,986
Venkatesan, Thirumalai		
Spin Polarized Quasiparticle Injection into High Temperature Superconductors	Navy	$187,665
Resonant Quantum Excitation in Oxide Superconductors	Navy	$95,000
Vishkin, Uzi		
Parallel Algorithmics-Some Current Changes	NSF	$218,951
Yang, Chia-Hung		
Fabrication of Hetero-Channel Silicon MOSFETs with 10nm Channel Length	ARMY	$251,634
Joint Program for Advanced Electronic Materials	NSA	$657,175
Modulated Tunneling Transistor	NSA	$201,419
Zaki, Kawthar		
Commercial Waveguide Filters	MIPS/K&L	$67,000
Development of Low Cost Millimeter Wave Multiplexers	MIPS/K&L	$80,000
Dual Mode Cavity Filters	MIPS/K&L	$67,011

Faculty Profiles

Eyad H. Abed

Professor,
Ph.D., University of California, Berkeley.
NSF Presidential Young Investigator;
Joint Appointment with ISR.

Research Interests

Dr. Abed's research interests are in nonlinear systems and control, with emphasis on control techniques aimed at modifying nonlinear dynamical behavior. Applications of the work under study include electric power systems and aeroengine compression systems.

Research problems under investigation include: the control of bifurcations leading to oscillations and chaos; the detection of nearness to instability using real-time monitoring techniques; the determination of the degree of participation of system variables in system modes; and the control of resonance phenomena. Power system applications being considered include: the use of network control devices to mitigate instabilities in power networks; the analytical study of the subsynchronous resonance phenomenon; and the monitoring of power networks for nearness to instability. He is also investigating stability conditions for power electronic networks. In another project, he is studying the monitoring and control of stall inception in aeroengine compression systems.

Professional Service

Ed. Advisory Board, *Nonlinear Dynamics*; Intl. Program Committee, Control of Oscillations and Chaos.

University Service

Electrical Engineering: Graduate Studies and Research Committee; General Academic Affairs Committee; Salary Committee; Faculty Search Committee. ISR: Chair, Outreach Committee. College of Engineering Council.

Recent Publications

E. H. Abed, "Instability Precursors and Bifurcation Control of Multistage Compression Systems," *1997 AFOSR Workshop on Dynamics and Control*, pp. 1-3, Dayton, May 1997.

Ashok K. Agrawala

Affiliate Professor,
Ph.D., Harvard.
IEEE Fellow; Joint Appointment with the Department of Computer Science and UMIACS.

Research Interests

Dr. Ashok K. Agrawala is a Professor of Computer Science and Electrical Engineering at the University of Maryland. For the past twenty years he has been actively involved in research in various aspects of computer systems design, implementation and performance.

Dr. Agrawala's research the last few years has been to understand the role of time in the design and implementation of computer systems. He has been working on the design problems for hard real-time systems, and has developed the MARUTI system. The goal of the MARUTI project is to create an environment for the development and deployment of applications with hard real-time, fault tolerance, and security requirements.

He has also developed a new networking technology–Cyclone. The novel feature of this technology is that all management is done in resource/time space, resulting in a network flow with end-to-end performance guarantees with low latencies.

Professional Service

2nd IEEE International Workshop on Factory Communication Systems Program Committee; CISE Research Infrastructure Site Visit for NSF, University of Pennsylvania.

University Service

IT Advisory Board (MAITI); Chair, Intellectual Property Rights Committee; Search Committee for Campus CIO.

Recent Publications

A. Agrawala, A. Cilingiroglu and S. Lee, "Real Time Communication," *The Froehlich/Kent Encyclopedia of Telecommunications*, Marcel Dekker, Inc., vol. 15, pp. 35-84, 1998.

J. Pointek, F. Shull, R. Tesoriero and A. Agrawala, "NetDyn Revisisted: A Replicated Study of Network Dynamics," *Computer Networks and ISDN Systems*, Elsevier Science, vol. 29, pp. 831-840, 1997.

S. Choi, L. Shi and A. Agrawala, "Intelligent Temporal Control," *IASTED Intl. Conf. on Intelligent Information Systems*, the Bahamas, December 1997.

A. Agrawala, S. Lee, "Cyclone Technology: An Overview," *University of Maryland Computer Science Technical Report*, CS-TR 3873, February 1998.

A. Agrawala, K. Kailas and B. Trinh, "Accuracy and Modern High Performance Processors: A Case Study Using Pentium Pro," *University of Maryland Computer Science Technical Report*, vol. CS-TR, p. 3820, August 1997.

S. Choi, L. Shi and A. Agrawala, "Designing Dynamic Temporal Controls for Critical Systems," *University of Maryland Computer Science Technical Report*, vol. CS-TR, p. 3804, May 1997.

S. Choi and A. Agrawala, "Scheduling Aperiodic and Sporadic Tasks in Hard Real-Time Systems," *University of Maryland Computer Science Technical*

Report, vol. CS-TR, p. 3794, May 1997.

S. Choi and A. Agrawala, "Dynamic Dispatching of Cyclic Real-Time Task with Relative Constraints," *University of Maryland Computer Science Technical Report*, vol. CS-TR p. 3770, March 1997.

K. K. Kailas and A. Agrawala, "An Accurate Time-management Unit for Real-time Processors," *University of Maryland Computer Science Technical Report*, vol. CS-TR, p. 3768, March 1997.

Thomas M. Antonsen, Jr.

Professor,
Ph.D., Cornell University.
American Physical Society Fellow; Joint Appointment with Physics.

Research Interests

Professor Antonsen's general research interests are the development of high power sources of microwave radiation, plasma physics, and nonlinear dynamics. Work in the area of high power sources of coherent radiation concentrates on the theoretical understanding of the nonlinear dynamics of mode competition in high power sources of coherent radiation such as free electron lasers, gyrotrons, and relativistic backward wave oscillators. Professor Antonsen is also involved with the development of numerical simulation tools, which are used in the design of high power microwave sources.

The recent development of intense, ultra-short pulse lasers has opened up new areas of research in laser plasma interactions. Professor Antonsen has concentrated on the self focusing and stability of short laser pulses propagating in tenuous plasmas. This work is conducted in close collaboration with the experimental efforts of Professor Milchberg, also of this department.

A third area of interest concerns multifractal properties of fluid flow. Efforts here concentrate on characterizing the properties of passive scalars (and vectors), which are transported by fluid flows that exhibit Lagrangian chaos. This work is relevant to the understanding of the turbulent mixing that arises in a number of natural and laboratory situations.

Professional Service

Divisional Assoc. Ed.: *Phys. Rev. Lett.*; IEEE Standing Technical Committee on Plasma Science and Applications Executive Committee.

University Service

Physics: Priorities Committee; Department Council; Undergraduate Education. Electrical Engineering: Chair, Facilities Services and Computers; Institute for Plasma Research: Executive Committee; Ad Hoc Appointment Committee. IPR: IPR Review Committee.

Recent Publications

R. A. Correa, B. Levush, and T. M. Antonsen, Jr., "High Efficiency Cavity Design of a 170 GHz Gyrotron for Fusion Applications," *Phys. Plasma*, vol. 4, p. 209, 1997.

P. Mora and T. M. Antonsen, Jr., "Kinetic Modeling of Intense Short Laser Pulses Propagating in Tenuous Plasma," *Phys. Plasma*, vol. 4, p. 217, 1997.

J. R. Marques, F. Dorchies, P. Audebert, J. P. Geindre, F. Amiranoff, J. C. Gauthier, G. Hammoniaux , A. Antonetti, P. Chessa, P. Mora, and T. M. Antonsen, Jr., "Frequency Increase and Damping of Non-linear Electron Plasma Oscillations in Cylindrical Symmetry," *Phys. Rev. Lett.*, vol. 78, p. 3463, 1997.

S. C. Venkataramani, T. M. Antonsen, Jr., and E., "Levy Flights in Fluid Flows with no KAM Surfaces," *Phys. Rev. Lett.*, vol. 78, p. 3864, 1997.

C. Reyl, T. M. Antonsen, Jr., and E. Ott, "Nature of the Vorticity Field Generated by Instabilities of Chaotic Fluid Flows," *Phys. Rev. Lett.*, vol. 78, p. 2259, 1997.

J. Jacobs, E. Ott, T. M. Antonsen, Jr., and J. Yorke, "Modeling Fractal Entrainment Sets of Tracers Advected by Chaotic Temporally Irregular Fluid Flows," *Physica*, vol. D110, p.1, 1997.

L. M. Gorbunov, P. Mora, and T. M. Antonsen, Jr., "Quasiastatic Magnetic Field Generated by a Short Laser Pulse in and Underdense Plasma," *Phys. Plasmas*, vol. 4, p. 4358, 1997.

S. P. Nikitin, T. M. Antonsen, Jr., T. R. Clark, Y. Li, and H. M. Milchberg, "Guiding of Intense Femtosecond Pulses in Preformed Channels," *Optics Lett.*, vol. 22, p. 1787, 1997.

E. Ott, T. M. Antonsen, Jr., and J. Jacobs, "Fractal Patterns of Tracers Advected by Smooth Temporally Irregular Fluid Flows and their Analysis by Use of Random Maps," *Fractals*, vol. 5, p. 119, 1997.

C. Reyl, T. M. Antonsen, Jr., and E. Ott, "Vorticity Generation by Instabilities of Chaotic Fluid Flows," *Physica*, vol. D 111, p. 202, 1998.

C. Reyl, T. M. Antonsen, Jr., and E. Ott, "Scaling Properties of a Magnetic Dynamo Wavenumber Power Spectrum Generated by Langrangian Chaotic Flows," *Phys. Plasmas*, vol. 5, p. 151, 1998.

John S. Baras

Professor,
Ph.D., Harvard University.
IEEE Fellow; Permanent Lockheed Martin Chair in Systems Engineering; Joint Appointment with ISR.

Research Interests

Dr. Baras' research interests are in the areas of intelligent control systems, real-time signal processing and understanding, hybrid communication networks, and virtual manufacturing systems.

In his most recent work on control systems, he has obtained several significant and pioneering results for the construction of real-time, robust, output feedback controllers. He is pursuing a long-term program in the foundations of intelligent control systems, including new concepts of computability and learning. He is continuing the development of intelligent manufacturing systems for smart materials and microelectronics. In

particular, he has developed intelligent systems for process planning to minimize cost and maximize quality in the manufacturing of hybrid electromechanical devices. He has also initiated studies for the design of hybrid architectures for intelligent control systems by combining neural networks, fuzzy logic chips, and DSP chips.

In his recent work in signal processing, he has obtained new mathematical results on the design of systems that combine data classification and compression, including constrained optimization of tree functionals, adaptive vector quantization, learning clustering algorithms, and decision trees. He has developed new multi-resolution methods for image modeling and processing, including weak continuity methods, stochastic morphology, and wavelet representations. He has also developed new, record-breaking algorithms for speech compression, text free speaker identification, and restricted grammar speech recognition.

He continues his studies on hybrid communication networks (integrated satellite and terrestrial networks) simulation and management. He has developed the foundations for the use of new object-oriented data models and object-oriented databases in network management with emphasis in configuration management and fault management. He also completed an award winning invention (Hybrid Internet Access) on the development of inexpensive, PC based, hybrid communication networks. He is currently studying extensions of ATM to wireless and satellite networks.

Professional Service

Assoc. Ed., *IMA Journal of Mathematical Control and Information*; Editorial Boards: *SARA*, *Systems & Control: Foundations & Applications, Mathematics of Systems and Control*. Internet Engineering Task Force Working Groups; ATM Forum and of the Satellite Industry Task Force; Expert Reviewer, Swedish Board of Industrial Research (NUTEK) of Industry-University Centers of Excellence; Maryland Economic Development Commission and DBED Board on Telecommunications Industry; Maryland Economic Development Commission and DBED Board on Information Technology Industry.

University Service

ISR: Executive Committee; APT Committee; Director, Center for Satellite and Hybrid Communications Networks. Maryland Applied Information Technology Initiative (MAITI); University Committee on the Review of Intellectual Property Right Policies; Leader. UMCP ATIRP Consortium effort; Consortium Management Committee.

Recent Publications

J. S. Baras and N. Patel, "Robust Control of Semiconductor Manufacturing Processes," *AMS-SIAM Summer Seminar on Mathematics of Stochastic Manufacturing Systems, The American Mathematical Society, Lectures in Applied Mathematics*, vol. 33, pp. 37-54, 1997.

J. S. Baras, "Infinite Dimensional Systems, Hardy Function Algebras, the Corona Theorem and Complexity," *Operators, Systems and Linear Algebra: Three Decades of Algebraic Systems Theory: In Honor of Professor Paul Fuhrmann*, Kaiserslautern, Germany, September 1997.

J. S. Baras and M. R. James "Robust and Risk-Sensitive Output Feedback Control for Finite State Machines and Hidden Markov Models," *J. of Mathematical Sys., Estimation, and Control*, vol. 7, no. 3, pp. 371-374, 1997.

J. S. Baras and N. Patel, "Robust Control of Set-Valued Discrete Time Dynamical Systems, *IEEE Trans. on Automatic Control*, vol. 43, no. 1, pp. 61-75, January 1998.

J. S. Baras and N. Patel, "A Framework for Robust Run by Run Control with Lot Delayed Measurements," *IEEE Trans. on Semiconductor Manufacturing*, Vol, 10, no. 1, pp. 75-83, 1997.

N. D. Sidiropoulos, J. S. Baras and C. A. Berenstein, "Weak Continuity with Structural Constraints," *IEEE Trans. on Signal Processing*, vol. 45, no. 12, pp. 3096-3104, December 1997.

J. S. Baras and N. S. Patel, "Nonlinear H8 Control with Delayed Measurements," *Proc. 4th European Control Conf. (ECC'97)*, pp. TU-E H5 (509), Brussels, Belgium, July 1997.

J. S. Baras, M. S. Corson, K. Doan, K. Jang, M. Li, A. Mishra, and H. Xie, "Tactical and Strategic Communication Network Simulation and Performance Analysis," *Proc. of the ATIRP: Advanced Telecommunications/Information Distribution Research Pgm.*, vol. 1, pp. 343-347, University of Maryland, College Park, MD, January 1997.

J. S. Baras and S. I. Wolk, "Wavelet-Based Hierarchical Organization of Image Data: Applications to ISAR and Face Recognition," *Proc. of the Conf. on Information Sci. and Sys.*, The Johns Hopkins University, Baltimore, MD, March 1997.

J. S. Baras, M. Ball, S. Gupta, P. Viswanathan and P. Shah, "Automated Network Fault Management," *Proc. of the MILCOM '97*, vol. 3, pp. 1244-1250, Monterey, CA, November 1997.

J. S. Baras, M. Ball, N. Roussopoulos, K. Jang, K. Stathatos, and J. Valluri, "Integrated Management of Large Satellite-Terrestrial Networks," *Proc. of the MILCOM '97*, vol. 1, pp. 383-387, Monterey, CA, November 1997.

J. S. Baras, S. Corson, S. Papademetriou, I. Secka and N. Suphasindhu, "Fast Asymmetric Internet Over Wireless Satellite-Terrestrial Networks," *Proc. of the MILCOM '97*, vol. 1, pp. 372-377, Monterey, CA, November 1997.

J. S. Baras, M. S. Corson, K. Jang, M. Li, A. Misra, and H. Xie, "Hierarchical, Layered Modeling and Performance Evaluation of Hybrid Communication Networks," *Proc. of the MILCOM '97*, vol. 3, pp. 1313-1371, Monterey, CA, November 1997.

R. Haridasan and J. S. Baras, "A Convex Model for the Robust Estimation of Optical Flow for Motion-Based Image Segementation," *Proc. of the 1997 Intl. Conf. on Image Processing (ICIP'97)*,

Santa Barbara, CA, October-November, 1997.

B. Frankpitt and J. S. Baras, "Estimation of Hidden Markov Models for Partially Observed Risk Sensitive Control Problems," *Proc. of the 5th IEEE Mediterranean Conf. on Control and Sys*., Cyprus, Greece, July 1997.

B. Frankpitt and J. S. Baras, "Combined Estimation and Control of HMMs." *Proc. of the IEEE Conf. on Decision and Control*, San Diego, CA, December 1997.

R. K. Karne, J. S. Baras, M. O. Ball, S. Bashyam, A. Kebede, J. Williams, V. S. Trichur, M. Karir, H. T. Lai and S. V. Dandekar, "Integrated Product and Process Design Environment Tool for Manufacturing T/R Modules," *Proc. of ETFA'97: 6th IEEE Intl. Conf. on Emerging Technologies and Factory Automation*, UCLA, Los Angeles, CA, September 1997.

K. Stathatos, N. Roussopoulos and J. S. Baras, "Adaptive Data Broadcast in Hybrid Networks," *Proc. 23rd Intl. Conf. on Very Large Databases*, pp. 326-335, Athens, Greece, August 1997.

A. Teolis and J. S. Baras, "Identification of Noisy FM Signals Using Nonorthogonal Wavelet Transforms," *Proc. SPIE 11th Annual Intl. Symposium on Aerospace/Defense Sensing, Simulation and Controls*, Orlando, Florida, April 1997.

J. S. Baras, and I. Secka, "High Performance IP Multicasting Over Wireless Satellite-Terrestrial Networks," *Proc. 17th AIAA Intl. Communications Satellite Systems Conf. and Exhibit*, February 1998.

R. Karne, J. S. Baras, M. Ball, S. Bahyam, A. Kebed, J. Williams, V. Trichur, M. Karir, H. Lai, S. Dandekar, "Integrated Product and Process Design Environment Tool for Manufacturing T/R Modules," *Proc. Intl. Assoc. of Management 15th Annual Intl. Conf.*, Montreal, Canada, August 1997.

H. Xie and J. S. Baras, "Performance Analysis of PNNI Routing in ATM Networks: Hierarchical Reduced Load Approximation," *Proc. of the MILCOM '97*, vol. 2, pp. 998-1002, Monterey, CA, November 1997.

M. Karir, V. Bharadwaj, K. Holleman, S. Papademetriou, N. Suphasindhu, and J. S. Baras, "Extensions of DBS and Hybrid Internet," *Proc. of the 2nd ACM Intl. Workshop on Satellite-Based Information Services (WOSBIS)*, pp. 67-74, Budapest, Hungary, October 1997.

J. S. Baras, "Hybrid Communication Networks for Video and Broadband Data Services," invited plenary address, *Proc. 2nd IEEE Symposium on Computers and Communications*, pp. 22, Alexandria, Egypt, July 1997.

J. S. Baras, "Linking Satellites with Terrestrial Networks for Digital Connectivity," invited plenary address, *Satellite Networks: Architectures, Applications and Technologies Workshop*, NASA Lewis Research Center, Cleveland, Ohio, June 1998.

J. S. Baras and S. I. Wolk, "Wavelet-Based Hierarchical Organization of Large Image Databases: ISAR and Face Recognition," *Proc. SPIE 12th Intl. Symposium on Aerospace, Defense Sensing, Simulation and Control*, Orlando, Florida, April 13-17, 1998.

R. Haridasan and J. S. Baras, "Accurate Segmentation and Estimation of Parametric Motion Fields for Object-Based Video Coding Using Mean Field Theory," *Proc. of SPIE 10th Annual Symposium on Visual Communications and Image Processing 1998 (VICP '98)*, vol. 3309, pp. 361-369 San Jose, CA, January 1998.

R. Poovendran, S. Ahmed, S. Corson, and J. S. Baras, "A Scalable Extension of Group Key Management Protocol," *Proc. of ARL Federated Laboratory 2nd Annual Conf.*, University of Maryland, College Park, Maryland, February 1998.

M. Y. Liu, J. S. Baras and A. Misra, "Performance Evaluation IN Multi-Rate, Multi-Hop Communication Networks with Adaptive Routing," *Proc. of ARL Federated Laboratory 2nd Annual Conf.*, University of Maryland, College Park, Maryland, February 1998.

Joseph B. Bernstein

AffiliateAssistant Professor, Ph.D., Massachussettes Institute of Technology. Joint Appointment with the Materials and Nuclear Engineering Department.

Research Interests

Dr. Bernstein specializes in reliability of microelectronic devices. His courses emphasize fundamental physical mechanism associated with failures in electronic and mechanical systems. He heads the degree program in microelectronics reliability and is actively involved in several areas of Microelectronics Reliability research including gate oxide integrity, time-dependent dielectric breakdown of ultra-thin oxide, metalization reliability, and bulk thermal-mechanical-electrical effects on the reliability of silicon power devices. His largest program is in developing methods to modify electronic circuitry by laser connections and disconnections at the wafer level. These techniques are applicable to wafer scale integration and multi-chip module schemes, as well as laser programmable gate arrays. His research programs include applications of Focussed Ion Beams (FIB) for analysis of laser-metal-dielectric interactions.

Programs are sponsored by NIST, NSA, JPL, ONR, and industry. Dr. Bernstein supervises a laboratory for laser processing of microelectronic devices and works with the Institute for Plasma Research. He has written a book chapter on laser formed metallic connections that will be published in the LIA Handbook of Laser Materials Processing and co-taught a short course on focussed ion-beam applications for microanalysis. Dr. Bernstein also works closely with the two major manufacturers of laser processing equipment and with a start-up company who has licensed his patents for commercial development. He has also lectured at

Cal Tech, Jet Propulsion Laboratory on the Fundamentals of Reliability Physics and Statistics as part of a NASA Summer Fellowship Award.

Professional Service

Intl. Reliability Physics Symposium technical program committee and registration committee; SPIE Conf. Session Chair, Microelectronics Manufacturing, IEEE Electron Devices and Reliability Society.

University Service

Graduate Admissions Chair, Reliability Program; Microelectronics Reliability Coordinator; Letters and Sciences Undergraduate Advisor.

Recent Publications

J. B. Bernstein, Y. Hua and W. Zhang, "Laser Energy Limitation for Buried Metal Cuts," *IEEE Electr. Dev. Let*., vol. 19, no. 1, January 1998.

M. Pecht, J. B. Bernstein, D. Searls, M. Peckerar, P. Karulkar, "Korea's Focus on Market Doninance," *Semiconductor Intl*., January, 1998

J. B. Bernstein, "Laser Programmable Interconnections Between Metal Lines," *Military and Aerospace Applications of Programmable Devices and Technologies Conf*., NASA (GSFC), September 1998

B. Stark, J. B. Bernstein, R. Lawton and G. Swift, "The Effects of Radiation on the Resonant Frequency of a Polysilicon Microstructure," *MEMS Reliability and Qualification Workshop, NASA (JPL)*, Pasadena, CA, August 1998.

M. Johnson and J. B. Bernstein, "Practical, Reliable, Hermetic Laser Modification of Metallic Interconnect," *Microelectronics Reliability and Qualification Workshop, NASA (JPL)*, Pasadena, CA, June 1998

Y. Chen, J. S. Suehle, B. Shen, J. B. Bernstein, P. Chaparala, and C. Messick, "The Correlation of Highly Accelerated Qbd Test to TDDB Life Tests for Ultra-Thin Gate Oxides," *Intl. Reliability Physics Symposium*, RENO, NV, April 1998.

J. B. Bernstein, "Laser Formed Connections for Programmable Wiring," *Proc. of the Custom Integrated Circuits Conf*., Santa Clara, CA, May, 1998.

Y. Chen, J. S. Suehle, B. Shen, J. B. Bernstein, C. Messick, "A New Technique to Extract TDDB Acceleration Parameters from Fast Qbd Tests," *Proc. of Intl. Integrated Reliability Workshop*, S. Lake Tahoe, CA, October, 1997.

Shuvra S. Bhattacharyya

Assistant Professor, Ph.D., University of California at Berkeley. NSF Career Award; Joint Appointment with UMIACS.

Research Interests

Dr. Bhattacharyya's research interests center around the areas of computer-aided design for embedded systems, and VLSI signal processing. Specific areas of current emphasis include memory management for signal, image and video processing algorithms; analysis and optimization of interprocessor communication overhead in embedded multiprocessors; uniprocessor and multiprocessor scheduling algorithms that effectively balance performance, power consumption, and cost based on the specific requirements of an application; the application of evolutionary algorithms to software and hardware synthesis; dataflow programming models for digital signal processing; hardware/software co-synthesis using arbitrary collections of programmable processors, reconfigurable logic blocks, and dedicated hardware units; performance analysis of computing systems that incorporate optical components; architectural strategies for the design of application-specific multiprocessors; and formal methods for models of computation that are employed in the specification of embedded systems.

Recent Publications

S. S. Bhattacharyya, S. Sriram, and E. A. Lee, "Optimizing Synchronization in Multiprocessor DSP Systems," *IEEE Trans. on Signal Processing*, vol. 45, no. 6, pp. 1605-1618, June 1997.

P. K. Murthy, S. S. Bhattacharyya, and E. A. Lee, "Joint Minimization of Code and Data for Synchronous Dataflow Programs," *J. of Formal Methods in System Design*, vol. 11, no. 1, pp. 41–70, July 1997.

S. S. Bhattacharyya, P. K. Murthy, and E. A. Lee, "Optimized Software Synthesis for Synchronous Dataflow," *Proc. Intl. Conf. on Application Specific Sys., Architectures, and Processors*, July 1997.

Gilmer L. Blankenship

Professor and Associate Chair for External Affairs, Ph.D, Massachusetts Institute of Technology. IEEE Fellow.

Research Interests

Dr. Blankenship's research interests are in the development and application of control theory. He is especially interested in the development of software tools for the application of nonlinear and optimal control methods to practical problems. His recent work includes the development of new models and methods for the suppression of acoustic radiation and mechanical vibration. He is also working on the application of "intelligent" control systems to certain classes of problems involving diagnostic systems.

University Service

Electrical Engineering: Associate Chair for External Affairs; Undergraduate Committee. Joint Math-Engineering Committee for Use of Software Instruction; University Senate; College of Engineering Alumni College Advisory Committee.

Recent Publications

H. G. Kwatny, C. LaVigna, and V. Polyakov, "Integrated Modeling and Design of Control System," *Proc. American Control Conf*., June 1997.

H. G. Kwatny, C. LaVigna, and M. Mattice, "A Workstation for Design of Distributed Parameter Control Systems," *Proc. Conf. on Computing Tech. in the 21st Century*, J. Periaux ed., Tours, France, May 1997.

Rama Chellappa

Professor,
Ph.D., Purdue University.
IEEE Fellow, NSF Presidential Young Investigator; Distinguished Research Faculty Fellow; International Association for Pattern Recognition Fellow; Joint Appointment with UMIACS.

Research Interests

Dr. Rama Chellappa's research interests span several areas, including context-based image exploitation, structure from motion, super resolution, image compression and automatic target recognition.

His research in Context-Based Image Exploitation involves the building of a system for the interpretation of vehicular traffic activities from aerial video input. This includes both low level (automatic generation of panoramic views) and high level (interpretation of events and activities using content derived from site models) processing. The context-based exploitation approach has been extended to processing NADAR images using wide area site models. Applications to object level change detection and object verification have been demonstrated.

His research in Automatic Target Recognition involves the use of SAR-extracted features to classify targets in SAR imagery. He is also incorporating multiple feature classes, which must each be matched within their own feature classes.

Another area of investigation is Rapid Target Update (RTU), the process of incremental acquisition and recognition or identification of objects from and approaching image sequence. He has proposed an algorithmic framework that integrates image sequence stabilization, moving object detection, segmentation, and object tracking algorithms.

Autonomous sensor position and orientation estimation is another area of investigation. A dynamic sensor position and orientation estimation system is being developed, using an on-board video camera and inertial sensors. This system includes a 2D motion estimation-based algorithm that generates a background mosaic, from which features are extracted and used to estimate the 3D motion of the sensor.

Another area of investigation is pulse LADAR. An existing LADAR ATR algorithm is being used to evaluate various sampling schemes to suggest an optimal sampling pattern for LADAR sensor design. In addition, a multisensor ATR algorithm is being developed through the fusion of ATR and FLIR data.

His research on robust transmission of compressed sources over noisy channels-coding and transmission issues focuses on several approaches for robust transmission of compressed source over noisy channels, including: (a) allocating source and channel coding rates to the different subbands of a source to minimize the end-to-end distortion, given constraints on the overall rate; (b) minimization of the average distortion over a fading channel when only the channel statistics are available at the transmitter; (c) Multiple Description Coding within the framework of a classification based subband coder; (d) the use of adaptive modulation for robust transmission of layered sources over time-varying channels; and (e) the use of soft-decision MAP decoding for joint source-channel decoding.

Research is also being conducted on the super-resolution of video data, or methods used for recovering fine high frequency details in signals/images, either by increasing the sampling density or by extrapolating the spectrum. Emphasis has been placed on developing a general theory leading to a practical algorithm working under realistic conditions of sensor degradations and noise.

Professional Service

Assoc. Ed., *IEEE Trans. Pattern Analysis and Machine Intelligence*; Board of Governors, IEEE Signal Processing Society; IEEE signal Processing Society Technical Committee on Multimedia Signal Processing; DARPA Panels on Dynamic Database, Continuous Tracking; NSF/DARPASponsored JTEC Panel on Digital Libraries.

University Service

Electrical Engineering Faculty Recruiting Committees.

Recent Publications

R. Chellappa, P. Burlina, X. Zhang, Q. Zheng, C. L. Lin,, V. Parameswaran, L. S. Davis and A. Rosenfeld, "Site Model Mediated Detection of Movable Object Activities," *RADIUS: IU for Imagery Intelligence*, O. Firschein, Morgan Kaufman, ed., pp. 285-318, 1997.

R. Chellappa, Q. Zheng, S. Kuttiked, S. Shekjar and P. Burlina, "Site Model Construction for Exploitation of EO and SAR Images," *RADIUS: IU for Imagery Intelligence*, O. Firschein, Morgan Kaufman, ed., 1997.

R. Chellappa, Q. Zheng, C. Shekhar and P. Burlina, "Site Model Supported Targeting," *RADIUS: IU for Imagery Intelligence*, O. Firschein, Morgan Kaufman, ed., pp. 357-372, 1997.

H. C. Liu, T. S. Hong, M. Herman and R. Chellappa, "A General Motion Model and Spatio-Temporal Filter for Computing Optical Flow," *Intl. J. of Computer Vision*, vol. 22, pp. 141-172, April 1997.

P. Burlina, R. Chellappa and C. L. Lin, "A Spectral Attentional Mechanism Tuned to Object Configurations," *IEEE Trans. Image Processing*, vol. IP-6, pp. 1117-1128, June 1997.

K. Etemad and R. Chellappa, "Discriminant Analysis for Recognition of Human Face Images," *J. Optical Society of America*, vol. 14, pp. 1724-1733, August 1997.

Y. S. Yao and R. Chellappa, "Selective Stabilization of Images Acquired by Unmanned Ground Vehicles," *IEEE Trans. Robotics and Automation*, vol. RA-13, pp. 693-708, October 1997.

K. B. Eom and R. Chellappa, "Non-Cooperative Target Classification Using Hierarchical Modeling of High Range

Resolution Radar Signatures," *IEEE Trans. Signal Processing*, vol. SP-45, pp. 2318-2327, Sept. 1997.

C. Morimoto and R. Chellappa, "Fast 3-D Stabilization and Mosaic Construction," *IEEE Computer Soc. Conf. of Computer Vision and Pattern Recognition*," Puerto Rico, pp. 660-665, June 1997.

C. Morimoto , P. Burlina and R. Chellappa, "Video Coding Using Hybrid Motion Compensation," *Proc. Conf. on Image Processing*, vol. 1, pp. 89-92, Santa Barbara, Calif., October 1997.

S. Matieu-Marni, S. Kuttikad and R. Chellappa, "Context-Aided False Alarm Reduction of SAR Automatic Target Recognition," *Proc. Conf. on Image Processing*, vol. 1, pp. 885-888, Santa Barbara, Calif., October 1997.

S. Srinivasan and R. Chellappa, "Image Stabilization and Mosaicking Using the Overlapped Basis Optical Flow Field," *Proc. Conf. on Image Processing*, vol. 3, pp. 356-359, Santa Barbara, Calif., October 1997.

R. Meth and R. Chellappa, "Stability and Sensitivity of Topographic Features for SAR Target Characterization," *Proc. Conf. on Image Processing*, vol. 3, p. 467, Santa Barbara, Calif., October 1997.

W. Phillips and R. Chellappa, "SAR Target Detection Algorithms on Linear SIMD Arrays," *Proc. Intl. Conf. Acoust., Speech, Signal Processing*, pp. 4101-4105, Munich, Germany, April 1997.

M. Srinivasan and R. Chellappa, "Joint Source-Channel Coding of Images," *Proc. Intl. Conf. Acoust., Speech, Signal Processing*, vol. 4, pp. 2925-2928, Munich, Germany, April 1997.

V. Parameswaran, P. Burlina and R. Chellappa, "Performance Characterization and Learning Approaches for Vehicle Detection and Counting," *Proc. Intl. Conf. Acoust., Speech, Signal Processing*, Munich, Germany, April 1997.

Mario Dagenais

Professor,
Ph.D., University of Rochester.
Joint Appointment with UMIACS.

Research Interests

Professor Dagenais' research interests are in the area of photonic switching, photonic integrated circuits, III-V integrated optoelectronics, and RF optoelectronics. In particular, he is interested in semiconductor traveling-wave laser amplifiers; arrays of laser sources and detectors, and wavelength-division multiplexed (WDM) optoelectronics components–for application in optical interconnects, parallel data links, free-space optical communication, optical networks and phased-array antennas. He is investigating the fabrication of active and passive optoelectronic devices based on III-V compound semiconductors, including lasers, optical amplifiers, pin detectors and waveguides. His group has patented a unique technique for the deposition of broad band antireflection coatings of semiconductor lasers using real-time in-situ ellipsometry. Substantial efforts are being devoted to the area of hybrid waferboard integration, using silicon substrates for the hybrid integration of optical and electronic devices, especially for the integration of alignment tolerant passive and active waveguides with optical fibers. Flip-chip bonding is a packaging approach actively being pursued, particularly in connection with O-E devices array packaging. Dagenais is the project director for a WDM testbed demonstration of a high performance distributed shared memory computing network called LIGHTNING, and is the co-director of the NSF sponsored I/UCRC Center on Optoelectronic Devices, Interconnects, and Packaging (COEDIP), recently formed at both the University of Maryland and the University of Arizona.

Professional Service

American Physical Society and the Optical Society of America; Senior Member, Institute of Electrical and Electronics Engineers; Co-Chair, Intl. Topical Meeting on "WDM Components Technology," sponsored by IEEE/LEOS; Co-Editor, special issue on "Packaging Using Alignment Tolerant Structures," *IEEE J. of Selected Topics in Quantum Electronics*; IEEE/LEOS Workshop on Semiconductor Lasers, CLEO'98, WDM & Broadband Access /Optoelectronic Packaging session organizer; Chair, Optoelectronic Packaging, Reliability and Manufacturing Committee, LEOS'98; SPIE Optoelectronic'98 Symposium, Vertical Cavity Surface Emitting Lasers II Committee; Chair, Optoelectronic Packaging, Reliability and Manufacturing Committee, LEOS'97; Chair, IEEE/LEOS Optoelectronic Packaging, Manufacturing, and Reliability subcommittee.

Recent Publications

S. A. Merritt, P. J. S. Heim, S. H. Cho, and M. Dagenais, "Controlled Solder Interdiffusion for High Power Semiconductor Laser Diode Die Bonding," *IEEE Trans. on Components, Packaging, and Manufacturing Technology PartB: Advanced Packaging*, vol. 20, no. 2, pp. 141-145, May 1997.

G. A. Porkolab, Y. J. Chen, S. A. Merritt, S. A. Tabatabaei, S. Agarwala, F. G. Johnson, O. King, M. Dagenais, R. A. Wilson, and D. R. Stone, "Wet-Chemistry Surface Treatment for Dark-Current Reduction that Preserves Lateral Dimensions of Reactive Ion Etched $Ga_{47}In_{53}As$ Diode Photodetectors," *IEEE Photonics Tech. Lett.*, vol. 9, p. 490, 1997.

S. W. Wilson, R. W. Armstrong, W. T. Beard, C. E. C. Colin, and M. Dagenais, "Oriented V-Groove Surfaces on Br2-CH3OH Etched (100) GaAs Wafers," *J. of Materials Science: Materials in Electronics*, pp. 109-113, 1997.

S. Kareenahalli, T. J. Tayag, M. Dagenais, and D. Stone, "Experimental Confirmation of Phase Relationships in Multimode Interference Splitters Using a Shearing Type Near-Field Sagnac

Interferometer," *IEEE Photonics Tech. Lett.*, vol. 9, July 1997.

F. G. Johnson, O. King, F. Seiferth, D. R. Stone, R. D. Whaley, M. Dagenais, and Y.-J. Chen, "Solid Source MBE Growth and Regrowth of 1.55 μm Wavelength GaInAsP/InP Ridge Lasers," *Crsytal Growth*, vol. 1756/176, pp. 46-61, 1997.

G. A. Porklab, Y. J. Chen, S. A. Merritt, S. A. Tabatabaei, S. Agarwala, F. Johnson, O. King, M. Dagenais, R. A. Wilson, and D. R. Stone, "Wet-Chemistry Surface Treatment for Dark-Current Reduction that Preserves Lateral Dimensions of Reactive Ion Etched GaInAsP p-i-n Diode Detectors," *IEEE Photonics Tech. Lett.*, vol. 9, pp. 490-492, 1997.

Z.F. Fan and M. Dagenais, "Optical Generation of a mHz-Linewidth Microwave Signal Using Semiconductor Lasers and a Discriminator-Aided Phase-Locked Loop," *IEEE Trans. on Microwave Theory and Techniques*, vol. 45, no. 8, pp. 1296-1300, August 1997.

B. Koley, R. Jin, G. Simonis, J. Pham, G. McLane, D. Stone, and M. Dagenais "Kinetics of Growth of AlAs Oxide in Selectively Oxidized Vertical Cavity Surface Emitting Lasers," *J. of Applied Phys.*, vol. 82, pp. 4586-4589, 1997.

M. Dagenais, "Dependence of Linewidth Enhancement Factor on the Number of Compressivley Strained Quantum Well Lasers" *IEEE Phot. Tech. Letters*, August 1997.

P. J .S. Heim, Z. F. Fan, S. H. Cho, K. Nam, F. G. Johnson, R. Leavit, and M. Dagenais, "Single-Angled-Facet Laser Diode for Widely Tunable External Cavity Semiconductor Lasers with High Spectral Purity," *Electron. Lett.*, vol. 33, no. 6, pp. 1387-1388, July 1997.

V. Vusirikala, S. S. Saini, R. E. Bartolo, R. Whaley, S. Agarwala, F. G. Johnson, D. R. Stone and M. Dagenais, "High Butt-Coupling Efficiency to Single Mode Fibers Using a 1.55 mm InGaAsP Laser Integrated with a Tapered Ridge Mode Transformer," *IEEE Phot. Tech. Lett.*, vol. 9, no. 11, pp 1472-1474, November 1997.

P.J. S. Heim, M. Dagenais, N. A. Krainak, R. Leavitt, "High-Sensitivity Semiconductor Optically Preamplified Q-PPM Receiver," *IEEE Photonics Tech. Lett.*, vol. 9, pp. 1394-1397, 1997.

V. Vusirikala, S. S. Saini, R. E. Bartolo, M. Dagenais, D. Stone, "Compact Mode Expanders Using Resonant Coupling Between a Tapered Active Region and an Underlying Coupling Waveguide," *IEEE Photonics Tech. Lett.*, vol. 10, pp. 203-205, 1998.

G. A. Porkolab, Y. J. Chen, S. A. Tabatabaei, S. Agrawala, F. G. Johnson, O. King, M. Dagenais, R. E. Frizell, W. T. Beard, and D. Stone, "Air-Bridge Ramps, Planarization, and Encapsulation Using Pyrolythic-Photoresist in the Fabrication of Three-Dimensional Microstructures," *J. of Vacuum Sci. Tech.*, vol. B., underbar 15, 1961 (1997).

F. Seiferth, F. G. Johnson, S. A. Merritt, S. Fox, R. D. Whaley, Y. J. Chen, M. Dagenais, and D. Stone, "Polarization Insensitive 1.55 μm Optical Amplifier with GaAs Delta-Strained Ga0.47In0.53As Quantum Wells," *IEEE Photonics Tech. Lett.*, vol. 9, pp. 1340-1342, 1997.

J. V. Collins, M. Dagenais, and M. Itoh, "Introduction to the Issue on Alignment Tolerant Structures for Ease of Optoelectronic Packaging," *IEEE J. on Selected Topics in Quantum Electronics*, vol. 3, p. 1306, 1998.

V. Vusirikala, S. S. Saini, R. E. Bartolo, S. Agarwala, R. D. Whaley, F. G. Johnson, D. R. Stone, and M. Dagenais, "1.55 μm inGaAsP/InP Laser Arrays with Integrated Mode Expanders Fabricated Using a Single Epitaxial Growth," *IEEE J. of Selected Topics in Quantum Electronics*, vol. 3, pp. 1332-1343, 1998.

S. Agarwala, S. C. Horst, O. King, R. Wilson, D. R. Stone, M. Dagenais and T. J. Chen, "High Density Inductively Coupled Plasma Ethcing of GaAs/AiGaAs in BCL_3/CL_2/Ar: A Study Using a Mixture Design Experiment," *J. Vac. Sci. Tech.*, vol. B16, pp. 1-4, 1998.

C.-H. Lee, H. Li, S. Didde, W. Lin, S. A. Merritt, Y.-J. Chen, M. Dagenais, and D. R. Stone, "Packaging of Optical Integrated Circuits Used in WDM Optical Communication Systems," *Inter Pack '97 Conf. Proc.*, 1997.

M. Dagenais, V. Vusirikala, S. A. Merritt, S. Saini, R. E. Bartolo, and D. R. Stone, "Alignment Tolerant Lasers and Silicon Waferboard Integration," in Optoelectronic Interconnects and Packaging IV, R. T. Chen, P. S. Guilfoyle, Ed., *Proc. of SPIE*, vol. 3005, pp. 38-47, 1997.

D. J. Copeland, S. A. Tabatabaei, S. A. Merritt, M. Dagenais, S. Didde, R. Y. J. Chen, D. R. Stone, A. J. Sprinthorpe, "Development and Performance of a 40 Gbps DWM Laser Module," in *Design and Manufacturing of WDM Devices, Proc. of SPIE*, vol. 3234, pp. 54-63, 1997.

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S.-H. Hsu, F. G. Johnson, Y.-C. Liu, F. J. Towner, S. A. Tabtabaei, S. Agarwala, J.

V. Hryniewocz, Y.-P. Ho, W. Lin, Y.-J. Chen, M. Dagenais, and D. R. Stone, "InGaAs p-i-n Photodiodes on AIGaAs/GaAs Waveguides and Monolithic Integration Applications," *Conf. on Lasers and Electro-Optics, OSA Tech. Digest Series*, vol. 11, pp. 448-449, 1997.

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R. D. Whaley, B. Gopalan, and M. Dagenais, "High Quality Dry Etched InP Semiconductor Laser Facets and Characterization Using Atomic Force Microscopy," *Conf. Proc. LEOS '97, 10th Annual Mtg.*, IEEE Catalog Number 97CH36057, vol. 1, pp. 11-12, 1997.

Z. F. Fan, P. J. S. Heim, and M. Dagenais, "Optical Generation of a Highly Coherent Microwave Signal by Heterodyne Phase Locking Two Grating Coupled External Cavity Semiconductor Lasers," *Conf. Proc. LEOS '97*, 10th Annual Mtg., IEEE Catalog Number 97CH36057, vol. 1, pp. 396-396, 1997.

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F. Seiferth, F. G. Johnson, S. A. Merritt, S. Fox, R. D. Whaley, Y. J. Chen, M. Dagenais, and D. R. Stone, "Polarization Insensitive 1.55-µm Optical Amplifier with GaAs Delta-Strained $Ga_{0.47}In_{0.53}As$ Quantum Wells," *Conf. Proc. LEOS '97, 10th Annual Mtg.,* IEEE Catalog Number 97CH36057, vol. 1, pp. 335-336, 1997.

V. Vusirikala, S. S. Saini, R. E. Bartolo, R. Whaley, S. Agarwala, F. G. Johnson, D. R. Stone and M. Dagenais, "High Butt-Coupling Efficiency to Single Mode Fibers Using a 1.55 υm InGaAsP Laser Integrated with a Tapered Ridge Mode Transformer," *Conf. Proc. LEOS '97, 10th Annual Mtg.*, IEEE Catalog Number 97CH36057, vol. 2, pp. 130-131, 1997.

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Christopher C. Davis

Professor, Associate Dean and Director of the Gemstone Program, Ph.D., Manchester University, United Kingdom.
IEEE Fellow; Institute of Physics Fellow; Joint Appointment with ISR.

Research Interests

Dr. Davis' research interests cover several areas: optical design, sensors, and systems, especially biosensors; near-field optical microscopy and lithography; line-of-sight optical communication systems; optoelectronic interconnects and packaging; atmospheric trace gas detection; biophysics; and bioelectromagnetics.

Hybrid fiber optic sensors are being developed for electric and magnetic field measurement. Sensors for biological and chemical agents use evanescent fields to excite fluorescence from surface bound layers, and interferometric and grating surface waveguide sensors detect surface-specific binding. Near-field optical microscopy is being carried out using tapered fibers and an interferometric reflection scheme that provides amplitude and phase images, with current resolution below 100nm. Any type of sample can be imaged, including live biological cells.

Research on line-of-sight optical communication links involves terrestrial paths up to a few kilometers long along paths close to the ground where the problems of atmospheric turbulence and obscuration can be significant. Issues such as fading, aperture averaging, coding, and system engineering for high data rate, low bit-error performance are being addressed.

Atmospheric trace gas detection currently involves measurement and mapping of very small molecules at concentrations into the low parts per trillion range. The technique uses photothermal interferometry.

In the biophysics/bioelectromagnetics area, research is aimed at better understanding the interaction of non-ionizing radiation with biological tissue. Dielectric measurements of the tissues in the head are being made to model the energy deposition from cellular telephones.

University Service

Electrical Engineering: Chair, Ph.D. Panel; Human Relations Committee. Director, Gemstone Program and Associate Dean, A. James Clark School of Engineering; College Park Senate; Senate Executive Committee; Senate Implementation Committee; Senate Committee on Committees; President's Awards Committee; Chair, President's Awards Committee; Council of University System Faculty; Graduate School Graduate Program Review Committee; Graduate Council Academic Standards Committee; College Park Representative, Maryland Higher Education Commission; College of Engineering Teaching and Learning Committee; Council on Undergraduate Education; President's Committee on the Quality of Work Life; President's Lesbian, Gay, and Bi-sexual Commission; Chemical Physics Program Committee; Chief Marshall, College of Engineering Commencement Ceremonies.

Recent Publications

C. C. Davis, W. A. Atia, A. Gungor, D. L. Mazzoni, S. Pilevar, and I. I. Smolyaninov, "Scanning Near-field Optical Microscopy and Lithography with Bare Tapered Optical Fibers," *Laser Physics*, vol. 7, pp. 243-255, 1997.

R. B. Wagreich and C. C. Davis, "Accurate Magneto-Optic Sensitivity Measurements of Some Diamagnetic Glasses and Ferrimagnetic Bulk Crystals Using Small Applied AC Magnetic

Fields," *IEEE Trans. on Magnetics*, vol. 33, pp. 2356-2361, 1997.

I. I. Smolyaninov, D. L. Mazzoni, J. Mait, and C. C. Davis, "Experimental Study of Surface-Plasmon Scattering by Individual Surface Defects," *Phys. Rev.*, vol. B56, pp. 1601-1611, 1997.

I. I. Smolyaninov, A. V. Zayats and C. C. Davis, "Near-Field Second-Harmonic Imaging of Ferromagnetic and Ferroelectric Materials," *Optics Lett.*, vol. 22, pp. 1592-1594, 1997.

I. I. Smolyaninov, A. V. Zayats and C. C. Davis, "Near-Field Second Harmonic Generation from a Rough Metal Surface," *Phys. Rev.*, vol. B 56, 9290-9293, 1997.

W. A. Atia, S. Pilevar and C. C. Davis, "Piezoelectric Tuning Fork Force Sensing of Optical Fiber Cantilevers," *4th Workshop on Industrial Applications of Scanned Probe Microscopy*, NIST, Gaithersburg, Md.

I. I. Smolyaninov, A. V. Zayats and C. C. Davis, "Mapping of Piezoelectric Ceramic Poling Using a Near-Field Optical Microscope," *4th Workshop on Industrial Applications of Scanned Probe Microscopy*, NIST, Gaithersburg, Md.

I. I. Smolyaninov and C. C. Davis, "Confined Surface Plasmon Beams Produced by Surface Defects: Potential for Novel Sensor Applications," *CLEO '97, OSA Tech. Digest Series*, vol. 11, pp. 146-147, Baltimore, Md., May 1997.

C. C. Davis, "In Vitro and In Vivo Dosimetry of RF and Microwave Exposure," *Second World Congree for Electricity and Magnetism in Biology and Medicine*," published in World Congress Abstract Book, Bologna, Italy, June 1997.

C. C. Davis, L. S. Taylor, and E. C. Elson, "Complex Dielectric Constants of Tissues in the Head," *Second World Congress for Electricity and Magnetism in Biology and Medicine*, published in World Congress Abstract Book, Bologna, Italy, June 1997.

C. C. Davis, "Fiber Near-Field Microscopy," invited Plenary Address at the *12th Intl. Conf. on Optical Fiber Sensors, OSA Technical Digest Series*, vol. 16, pp. 8-12, Williamsburg, Va., 1997.

S. Pilevar, C. C. Davis and F. Portugal, "Evanescent Wave Tapered Optical Fiber Gene Probe Assay Sensor," 12th Annual Conf. on Optical Fiber Sensors," *OSA Technical Digest Series*, vol. 16, pp. 362-365, Williamsburg, Va., 1997.

A. Fielding and C. C. Davis, "Flourescent Porous Sol-gel Coatings for Near-IR Single-Mode Fiber Chemical Sensors," *Conf. on Micro- and Nano-Fabricated Structures and Devices for Biomedical Environmental Applications, SPIE BiOS '98 Intl. Biomedical Symp. at Photonics West*, San Jose, Calif., January 1998.

I. I. Smolyaninov, C. H. Lee, C. C. Davis and A. V. Zayats, "Near-Field Optical Microscopy of Surface Second Harmonic Generation," *1998 March Mtg. of the American Physical Society*, abstract in Bull. Am. Phys. Soc., vol. 43, p. 481, Los Angeles, Calif., March 1998.

Nicholas DeClaris

Professor,
Sc.D., Massachusetts Institute of Technology.
IEEE Fellow; Joint Appointment with School of Medicine, UMAB.

Research Interests

Dr. DeClaris' research interests are in the intersection of system science, computer engineering, and medicine. He directs the E.E. Medical Informatics and Computational Intelligence Research Laboratory (http://www.ee.umd.edu/medlab). He is also Professor in the Pathology Department of the University of Maryland School of Medicine in Baltimore, and Director of the Medical Informatics Division. His current emphasis is on exploratory research in computational intelligence and in pathology informatics. He leads interdisciplinary research teams that involve novel computational intelligence and knowledge engineering methodologies such as: integration of intelligent databases, expert and fuzzy systems and neural networks; clustering, visualization and learning using multi-dimensional data for data mining, cognitive information and image selection, learning and cognitive systems operating in real-time multiprocessor environment.

Applications include: design of automated aids to diagnostic and therapeutic decision making regarding structural and functional abnormalities (in machines and/or in humans; hierarchial planning for autonomous vehicle path planning and formation keeping and designs of machine functional units and architectures inspired by brain structures and functions. These topics provide support and M.S. theses and Ph.D. dissertation research material for several graduate students and a few undergraduate research and design topics. Significant results in sponsored research include: application of neural networks in cluster analysis; neural network based planner/learner for control systems; visual heuristics for data clustering; an unsupervised neural network approach to medical data mining techniques; heuristic similarity measure characterization for content-based image retrieval and a machine Pathology to system research and engineering.

Professional Sevice

Vice President for Publications, IEEE Systems, Man and Cybernetics Society; IEEE SMC Executive Administrative Committee; Intl. Federation for Information Processing, Permanent Working Committee Member on Modeling and Simulation; Intl. Conferences on Advances in Comm. and Control (COMCON), Permanent Program Committee Member; 1999 Joint Intl. Conf. on Neural Networks Technical (IEEE/INNS) Program Committee; World Congress of Nonlinear Analysts 2000 Technical Program Committee.

Recent Publications

N. DeClaris, "Neural Networks," in the *Encyclopedia of Science and Technology*, McGraw-Hill Book Company, New York, 1998, pp 752-757.

M.-C. Su, N. DeClaris and T.-K. Liu, "Application of Neural Networks in

Cluster Analysis," *1997 IEEE Intl. Conf. on Systems, Man and Cybernetics*, vol. 1, pp. 1-6, Oct. 1997.

W. Peng, and N. DeClaris,, "Heuristic Similarity Measure Characterization for Content-Based Image Retrieval," *1997 IEEE Intl. Conf. on Systems, Man and Cybernetics*, vol. 1, pp. 7-12, Oct. 1997.

T.-D. Tran-Luu and N. DeClaris, "Visual Heuristics for Data Clustering," *1997 IEEE Intl. Conf. on Systems, Man and Cybernetics*, vol. 1, pp. 19-24, Oct. 1997.

N. DeClaris, H. Szu, K. Baheti, and J. Wentworth, "Forum on Computational Cybernetics–Its Opportunity and Challenge," *1997 IEEE Intl. Conf. on Systems, Man and Cybernetics*, vol. 2, pp. 969-976, Oct. 1997.

J. Albus, N. DeClaris, A. Lacaze and A. Meystel, "Neural Network Based Planner/Learner for Control Systems," *Proc. Intl. Conf. on Intelligent Systems and Semiotics: A Learning Perspective*, pp 75-81, NIST, Sept. 1997.

N. DeClaris, "Beyond Viruses: Machine Pathology–New Horizons in System Research and Engineering," *Proc. Sixth Intl. Conf. on Advances in Communication and Control*, COMCON, UNLV, 1997

D. Shalvi and N. DeClaris, "An Unsupervised Neural Network Approach to Medical Data Mining Techniques," *Proc. 1998 Intl. Joint Conf. on Neural Networks (IJCNN98), IEEE and INNS*, Anchorage, AK, 1998.

Fawzi P. Emad

Professor,
Ph.D., Northwestern University.

Research Interests

Dr. Emad's research interests are in the general areas of control, power systems, and electromagnetics. His current research activities are in the areas of nondestructive testing of aggregate and amorphous materials, maglev, and special electromechanical machines. Currently he is working on the design of a very small generator with a tiny amount of mechanical input power. Eddy current losses and hysteresis losses need to be minimized (practically eliminated) in order to obtain sufficient efficiency.

University Service

Department of Electrical Engineering Facilities Committee; Coordinater of a distance learning program involving three sister campuses: University of Maryland Eastern Shore (UMES), Salisbury State University (SSU), and Frostburg State University (FSU).

Anthony Ephremides

Professor,
Ph.D., Princeton University.
IEEE Fellow;
Joint Appointment with ISR.

Research Interests

Dr. Ephremides' research interests are in the area of communication sciences and systems, including wireless, satellite, and hybrid systems, and modeling, analysis, and evaluation issues. His current research activities include mobility tracking, algorithms for self-organizing networks, optimal indoor wireless network designs, directive antennas, and spot-beam switching. He headed a broad experimentation and simulation test-bed program that involved NASA's Advanced Communication Technology Satellite, and is interested in design tools for optimal network performance. His research aims at combining networking and signal processing issues as they arise in the design of future networks that offer multimedia services. Related activities include queueing system modeling and analysis and optimization. Recently, he has initiated an effort in exploring the impact of wireless networking protocols on energy efficiency.

Professional Service

1997 IEEE International Symposium on Information Theory Technical Program Committee; 1998 IEEE International Symposium on Information Theory Technical Program Committee; 1998 IEEE INFOCOM Technical Program Committee; 1998 IEEE International Symposium on Computer Communications Technical Program Committee; IEEE Technical Activities Board Strategic Planning Committee (SPARC); IEEE Fellows Committee; Columnist; *IEEE Information Theory Society Newsletter* (Historian's Column); ABET Evaluator; Editorial Board, *Journal on Wireless Networks*; Guest-Editor, *Journal of Wireless Networks on Satellite Systems*; Guest-Editor, IEEE *JSAC Satellite and Hybrid Networks.*

University Service

University Appeals Committee. Electrical Engineering: Department Ph.D. Panel. ISR: Appointments and Tenure Committee; Salary Committee.

Recent Publications

P. Bhattacharya, L. Tassiuslas, A. Ephremides, "Optical Scheduling with Deadline Constraints in Tree Networks," *IEEE Trans. on Automatic Control*, pp. 1703-1705 December 1997.

D. Ayyagari, A. Ephremides, "A Satellite-Augmented Cellular Network Concept," *Journal of Wireless Networks*, pp. 189-199, February 1998.

G. D. Nguyen, J. Wieselthier, A. Ephremides, "Lagrangian Techniques for Optimizing Throughput in Wireless Communication Networks Subject to QoS Constraints," *Proc. Conf. on Information Sciences and Systems*, pp. 405-410, Baltimore, MD, March 1997.

J. Wieselthier, C. Barnhart, A. Ephremides, "Ordinal Optimization of Discrete-Event Dynamic Systems: A Comparison of Standard-Clock and Common-Random-Number Methods," *Proc. Conf. on Information Sciences and Systems*, pp. 654-659, Baltimore, MD, March 1997.

D. Friedman, A. Ephremides, "A Scheme to Improve Throughput for ARQ-Protected Satellite Communication," *Proc. Intl. Mobile Satellite Conf.*, pp. 39-43, Pasadena, CA, June 1997.

K. Sayrafian-Pour, A. Ephremides, "Can

Spatial Separation Increase Throughput of Conflict Resolution Algorithms?" *Proc. Intl. Symposium on Information Theory*, pp. 318-319, Ulm, Germany, July 1997.

R. Bhattacharya, A. Ephremides, "A Distributed Multicast Routing Protocol for Ad-Hoc (Flat) Mobile Wireless Networks," *_IEEE Conf. on Personal, Mobile, Indoor, Radio Communications (PIMRC)*, pp. 877-881, Helsinki, Finland, September 1997.

W. Luo, A. Ephremides, "Effect of Packet Length and Power Level on Random Multiple Access," *Proc. 35th Annual Allerton Conf. on Communication, Control, and Computing*, pp. 583-585, Monticello, IL, September 1997.

J. Wieselthier, C. Barnhart, A. Ephremides, "Three Techniques for Ordinal Optimization: Short Simulation, Crude Analytical Models, and Imprecise Simulation Models," *Proc. of 1997 Intl. Conf. on Intelligent Systems and Semiotics*, pp. 175-181, Gaithersburg, MD, September 1997.

J. Wieselthier, G. Nguyen, A. Ephremides, "Algorithms for Finding Optimal Offered Loan in Wireless Communication Networks," *Proc. IEEE MILCOM*, Session 41.06, Monterey, CA, November, 1997.

S.-T. Yang, A. Ephremides, Optimal Network Design: The Base Station Placement," *Proc. IEEE Conf. on Decision and Control (CDC)*, pp. 2381-2386, San Diego, CA, December 1997.

S.-T. Yang, A. Ephremides, "Topological Design of Interconnected LANs Using Hopfield Neural Networks," *Proc. IEEE Conf. on Decision and Control (CDC)*, pp. 3568-3573, San Diego, CA, December 1997.

D. Ayyagari, A. Ephremides, "Cellular DS-CDMA Capacity for Integrated Voice and Data Services," *Proc. 17th AIAA Intl. Communication Satellite Systems*, pp. 256-264, Yokohama, Japan, February 1998.

T. Elbatt, A. Ephremides, "Optimization of Connection-Oriented, Mobile, Hybrid Network Systems," *Proc. 17th AIAA Intl. Communication Satellite Systems,* pp. 256-264, Yokohama, Japan, February 1998.

Nariman Farvardin

Professor and Chair, Ph.D., Rensselaer Polytechnic Institute. IEEE Fellow; NSF Presidential Young Investigator; Joint Appointment with ISR.

Research Interests

Dr. Farvardin's research interests are in the general area of information theory and coding, signal compression with applications to speech, image and video coding and transmission, speech and speaker recognition and digital communications. His current research activities are heavily focused on signal compression and coding for heterogeneous communication networks, including wireless links. This includes the study of efficient, low-complexity and scalable compression systems. Here, scalability refers to scalability in resolution (both temporal and spatial) and scalability in encoding rate. Scalability in resolution is an important feature in multicasting applications where different receivers have different resolutions, whereas scalability in encoding rate provides the capability for progressive transmission, a desirable property for telebrowsing.

Another component of this research concentrates on the development of techniques for robust transmission of compressed signals over noisy communication channels, such as those arising in wireless networks. This includes the study of power control policies, channel-adaptive decoding schemes, combined source-channel coding schemes, unequal error protection, and dynamic rate allocation mechanisms. A goal of this research is the establishment of a real-time, multimedia, signal transmission platform for communication over wireless communication networks. Another related activity is the development of low-rate, low-complexity and multi-resolution video compression systems for real-time, desktop video teleconferencing over a wireline local area network. Currently, we have two experimental platforms for software-only implementation of real-time video compression systems.

Finally, there is another activity underway on the development of region of interest coding techniques for still image compression situations.

University Service

Chair, Department of Electrical Engineering; Middle States Self-Study Steering Committee; Strategic Plan Advisory Committee; Chair, Aerospace Engineering Chair Search Committee; Chair, Committee for UMCP Policy on Indirect Cost Rates; Committee for Institute for Plasma Research Review; Strategic Plan Advisory Committee; Presidential Search Committee, University of Maryland; School for Engineering Information Technology Committee.

Recent Publications

N. Phamdo, F. Alajaji and N. Farvardin, "Quantization of Memoryless and Gauss-Markov Sources over Binary Markov Channels," *IEEE Trans. Commun.*, vol. 45, pp. 668-675, June 1997.

R. Joshi, H. Jafarkhani, J. Kasner, T. Fischer, N. Farvardin, M. Marcellin and R. Bamberger, "Comparison of Different Methods of Classification in Subband Coding of Images," *IEEE Trans. Image Proc.*, pp. 1473-1487, November 1997.

H. Jafarkhani, H. Brunk and N. Farvardin, "Entropy-Constrained Successively Refinable Scalar Quantization," *Data Compression Conference*, pp. 337-346, Snow Bird, UT, April 1997.

P. Ligdas and N. Farvardin, "Finite-State Power Control for Fading Channels," *Proc. Conf. on Information Sciences and Systems*, pp. 399-404, Johns Hopkins University, Baltimore, MD, March, 1997.

V. Chande, H. Jafarkhani and N. Farvardin, "Joint Source-Channel Coding of Images for Channels with Feedback," *Proc. IEEE Information Theory Workshop*, (invited paper), pp. 50-51, San Diego, CA, Sept. 1997.

Jeffrey Frey

Professor,
Ph.D., University of California, Berkeley.
IEEE Fellow.

Research Interests

Dr. Frey's research interests are in the general area of the physics of very small semiconductor devices, as used in VLSI circuits and in opto-electronic and microwave systems.

His current research activities are in the areas of new approaches to integrated circuit mass production and the useful application of hot-electron phenomena in semiconductor devices. He is examining alternatives to standard batch-based wafer processing–which may result in higher throughput, greatly increased flexibility in product, and lower factory costs. These alternatives make considerable use of energy-beam processing, such as ion and laser-assisted etching, deposition, and materials growth.

He is also exploring the use of short-channel MOSFET's in a new configuration as light emitters. These devices make use of the very energetic electrons that are generated in the channel of these MOSFET's, and hold the promise of very small but very intense light sources.

Professional Service

NSF Graduate Fellowship Selection Panel.

University Service

Electrical Engineering: Graduate Studies and Research Committee.

Jerome A. Gansman

Assistant Professor,
Ph.D., Purdue University.
Joint Appointment with ISR.

Research Interests

Dr. Gansman's research interests lie in many different aspects of physical layer communication systems - particularly in digital communications theory, fading channel communications, and synchronization of communications systems.

His recent research has focused on synchronization issues for narrowband land mobile wireless communications channels. In a narrowband wireless communications system the symbol time is very long compared to the multipath delay spread on the channel, so the multipath is combined into a single multiplicative distortion process (i.e., frequency non-selective fading). This environment generates very little ISI and rarely requires sophisticated equalization techniques; however, the multipath distortion process can produce significant signal fading on mobile links and significant performance variation with antenna location on stationary links. Mitigating the effects of these deep fades is critical to achieving reliable communication at a reasonable signal-to-noise ratio (SNR). Periodically transmitting a known symbol essentially provides the receiver with a sample of the bandlimited fading process which it can use to derive its amplitude and phase reference. This method for achieving coherent communications is referred to as pilot symbol assisted modulation (PSAM).

Dr. Gansman has developed several optimum and reduced complexity frame synchronization algorithms for locating the known pilot symbols in the noisy received data stream. These algorithms are based on a quadratic correlation detector which is tailored to the second order statistical characteristics of the channel and provide a modem designer two alternatives depending on whether fixed acquisition time or fixed acquisition performance is more important. Dr. Gansman has also investigated techniques to use the pilot symbols to estimate frequency mismatch between the transmitter and receiver, i.e., carrier synchronization, and the effects of the pilot frame structure on the estimation performance. His future research projects in PSAM systems will involve symbol timing estimation and optimum frame structure design.

University Service

ISR 1998 ISR Elections Board

Recent Publications

J. Gansman, M. Fitz and J. Krogmeier, "A Comparative Study of a Class PSAM Frame Synchronizers," *Intl. J. of Wireless Info. Networks*, vol. 4, no. 1, pp. 7-20, 1997.

J. Gansman, M. Fitz and J. Krogmeier, "Optimum and Suboptimum Frame Synchronization for Pilot Symbol Assisted Modulation," *IEEE Trans. Comm.*, vol. 45, no. 10, pp. 1327-1337, October 1997.

J. Grimm, M. Fitz, J. Krogmeier, T.-A. Chen, T. Magnusen, J. Gansman, and W.-Y. Kuo, "High Efficiency Narrowband Wireless Modems for ITS Applications," *Intelligent Transportation Systems (ITS) Journal*, vol. 3(4), pp. 333-352, 1997.

J. A. Gansman, M. P. Fitz, and J. V. Krogmeier, "Maximum Likelihood Frame Synchronization for PSAM," *Proc. Forty-Seventh Annual IEEE Vehicular Technology Conf., pp. 1054-1058, May 1997.*

J. Grimm, M. P. Fitz, J. V. Krogmeier, T.-A. Chen, J. A. Gansman, T. Magnusen, and W.-Y. Kuo, "An Efficient Modem for Narrowband Wireless Communications in the 220 MHz Band," (invited) *Proc. 47th Annual IEEE Vehicular Technology Conf.*, pp. 909-913, Phoenix, AZ, May 1997.

Evaggelos Geraniotis

Professor,
Ph.D., University of Illinois, Urbana-Champaign.

Research Interests

Dr. Geraniotis' research interests are in the area of communication networks – with emphasis on wireless networks, digital communication systems with emphasis on spread-spectrum techniques, and signal interception and exploitation, with emphasis on multi-sensor fusion and non-Gaussian processing techniques.

The main thrust of his current research activities focuses on the design and performance evaluation of cellular, personal communications system (PCS), spread-spectrum (CDMA) techniques. Issues of wireless channel modeling, interference mitigation, antenna and path (RAKE) diversity combining, power control, dynamic code allocation, multi-media multi-rate traffic integration, cell/microcell/picocell hand-off, the interfaces with backbone PSTN, LAN and ATM wireless networks, user mobility management, and registration are studied, and the systems designs are optimized. Similar research issues and optimized system designs are pursued for wireless networks using TDMA-based multiple-access techniques. Another substantial thrust of his research focuses on the development of analytical techniques and software tools for the modeling, performance evaluation, and design of multi-media high-speed (e.g., ATM and B-ISDN) as well as hybrid (wireline, terrestrial wireless, and satellite) networks. Multi-media variable-rate traffic models based on Markov processes and self-similar processes are studied, together with analytical approximation techniques for accurate but fast performance evaluation of end-to-end QoS (quality of service) of the multi-media traffic and performance measures at the intermediate network nodes; these are used for sensitivity analysis and control optimization of protocols for connection admission control, bandwidth allocation/multiplexing, routing, buffer management, switch control, flow control, and hand-off. Versions of these tools which can stand alone or can support OPNET simulation software are developed.

Professional Service

Intl. Symposium on Computers and Communications (ISCC'98) Technical Program Committee; 5th IEEE Intl. Symposium on Spread Spectrum Techniques and Applications (ISSSTA'98) Intl. Advisory Committee.

University Service

Graduate Studies and Research Committee.

Recent Publications

E. Geraniotis and Y.-W. Chang, "Optimal Joint Handoff and Code Assignment in Cellular CDMA Networks," *Wireless Communications: TDMA versus CDMA,* S. Glisic and P. Leppanen Editors, Kluwer Academic Publishers, Norwell, MA, pp. 181-187, September 1997.

Y.-W. Chang and E. Geraniotis, "Optimal Policies for Handoff and Channel Assignment in Networks of LEO Satellites Using CDMA," Special Issue on Satellite Communications, *J. on Wireless Networks*, Baltzer AG, Science Publishers pp. 181-187, February 1998.

H.-J. Su and E. Geraniotis, "Performance Comparison Between Wavelet Packet Division MA and DS/CDMA in Bandlimited Channels," *Proc. 1997 Conf. on Information Sciences and Systems (CISS)*, pp. 960-965, Johns Hopkins Univ., March 1997.

P. C. Li and E. Geraniotis, "Effect of Amplifier Nonlinearity on Synchronous M-PSK DS-CDMA," *Proc. 1997 Conf. on Information Sciences and Systems (CISS)*, pp. 966-971, Johns Hopkins Univ., March 1997.

C.-H. Chou and E. Geraniotis, "Effects of Higher-Order Statistics and Time Scales of LRD Traffic on Resource Allocation of ATM Networks." *Proc. 1997 Conf. on Information Sciences and Systems (CISS)*, pp. 45-50, Baltimore, March 1997.

S.-C. Liu and E. Geraniotis, "An Eigenvalue Decomposition and Interference Cancellation Array Processing Algorithm for Low Mobility CDMA Communications," *Proc. 1997 IEEE Signal Processing Workshop on Advances in Wireless Communications*, pp. 205-208, Paris, France, April, 1997.

F. Fruth and E. Geraniotis, "A Blind Adaptive Array Algorithm for Multi-Media CDMA Wireless Networks," *Proc. 1997 Intl. Conf. on Telecommunications (ICT)*, Melbourne, Australia, pp. 1187-1192, April, 1997.

C.-H. Chou and E. Geraniotis, "Modeling of Long-Range Dependent Traffic in ATM Networks Using Heterogeneous On-Off Sources," *Proc. 1997 Intl. Conf. on Telecommunications (ICT)*, pp. 111 - 115, Melbourne, Australia, April 1997.

S.-C. Liu and E. Geraniotis, "High Performance Array Algorithm for DS/CDMA Communications," *Proc. 1997 IEEE Vehicular Technology Conf. (VTC)*, pp. 1173-1176, Phoenix, AZ, May 1997.

H.-J. Su and E. Geraniotis, "Performance Analysis of an Asynchronous Wavelet Packet Division Multiple Access System," *Proc. 1997 Communications and Control Conf. (COMCON)*, pp. 267-272, Corfu, Greece, June 1997.

W.-C. Chan and E. Geraniotis, "A Medium Access Protocol for Interconnecting ATM and Wireless Networks," *Proc. 1997 IEEE Intl. Conf. on Communications*, pp. 1448-1453, Montreal, Canada, June 1997.

M. Khairy and E. Geraniotis, "Effect of Time Jitter on Synchronous CDMA Networks and Quasi-Orthogonal Sequences," *Proc. 1997 Symposium on Computers and Communications (ISCC)*, pp. 260-264, Alexandria, Egypt, July 1997.

P.-C. Li and E. Geraniotis, "Effect of Amplifier Nonlinearities on Synchronous M-PSK CDMA Terrestrial and Satellite Systems." *Proc. 1997 Symposium on Computers and Communications (ISCC)*, pp. 275-279, Alexandria, Egypt, July 1997.

W.-C. Chan, V. D. Nguyen and E. Geraniotis, "An Adaptive Hybrid FEC/ARQ Protocol Using Turbo Codes," *Proc. 1997 Intl. Conf. on Universal Personal Communications (ICUPC)*, pp. 541-545, San Diego, CA, October 1997.

S. Yao and E. Geraniotis, "Performance Evaluation of a Multi-Rate CDMA System with Orthogonal Modulation over a Multipath Fading Channel," *Proc. 1997 Intl. Conf. on Universal Personal Communications (ICUPC)*, pp. 632-636, San Diego, CA, October 1997.

S.-C. Liu and E. Geraniotis, "Array Processing for Slow Frequency-Hopped Multiple-Access (FHMA) and FH/TDMA with Overlap Channel Transmission," *Proc. 1997 IEEE Conf. on Global Communications (GLOBECOM)*, pp. 394-398, Phoenix, AZ, October, 1997.

P.-C. Li and E. Geraniotis, "Effect of Amplifier Nonlinearities on Asynchronous DS/CDMA Systems," *Proc. 1997 IEEE Conf. on Military Communications (MILCOM)*, pp. 124-128, Monterey, CA, November 1997.

S.-C. Liu and E. Geraniotis, "Joint Frequency Compensation and Angle Estimation for Array Processing in Frequency-Hopped Multiple-Access (FHMA) Networks," *Proc. 1997 IEEE Conf. on Military Communications (MILCOM)*, pp. 271-274, Monterey, CA, November, 1997.

S. Chuprun, C. Bergstrom, E. Geraniotis, and H. ElGamal, "Comparison of FH/CDMA and DS/CDMA for Wireless Survivable Networks," *Proc. Annual Conf. of the Advanced Telecommunications/Information Distribution Research Program–An ARL Federated Laboratory*, pp. 347-352, January 1998.

H. ElGamal and E. Geraniotis, "Enhancing the Capacity of Frequency-Hopped Multiple-Access Networks: Synchronous FH/SSMA," *Proc. Annual Conf. of the Advanced Telecommunications/Information Distribution Research Program–An ARL Federated Laboratory*, pp. 172-176, January 1998.

S.C. Liu and E. Geraniotis, "Antenna Array Processing Techniques for Frequency-Hopped Multiple-Access Networks," *Proc. Annual Conf. of the Advanced Telecommunications/Information Distribution Research Program–An ARL Federated Laboratory*, pp. 182-186, January 1998.

W.C. Chan and E. Geraniotis, "An Adaptive Hybrid FEC/ARQ Protocol Using Turbo Codes for Multi-Media Transmission of ATM over Wireless Networks," *Proc. Annual Conf. of the Advanced Telecommunications/Information Distribution Research Program–An ARL Federated Laboratory*, 177-181, January 1998.

M. Hadjitheodosiu and E. Geraniotis "Dynamic Bandwidth Allocation for Multi-Media Traffic in TDMA Broadband Satellite Networks," *Proc. 18th AIAA Intl. Communications Satellite Systems Conf.*, pp. 178-186, Yokahama, Japan, February 1998.

Virgil D. Gligor

Professor,
Ph.D., University of California, Berkeley.

Research Interests

Dr. Gligor's research interests are in the general area of computer, distributed system, and network security. His current research activities are focussed on cryptographic protocol analysis, in particular, message integrity and authentication protocols in large computer networks. Message integrity research includes both the cryptographic protection of message content and the authentication of the message origin. Because message integrity is a desirable property for a large variety of seemingly different protocols and applications, an abstract formal model of message integrity is being developed for protocol analysis.

The preliminary application of this model to protocol analysis has helped the discovery of integrity flaws in well-known protocols used in practice.

Another significant component of this research is authentication in networks and distributed systems, organized as a set of interconnected administrative realms or domains. Cross-realm authentication policies may differ from application to application, and the design and implementation of sound policies constitute a key aspect of secure user authentication in very large distributed systems and networks.

His research also includes scalable access control systems, and penetration analysis techniques. Current access control systems, which are generally based on per-object, access-control lists, do not scale up to configurations of hundreds of thousands of users and millions of objects, as one might find in a global enterprise. Here, scalability refers to the ability to distribute, review, and revoke access permissions for different users of the enterprise correctly and efficiently. Role-based access control is being investigated as the basis for scalable access management.

Another related activity is the penetration analysis of computer systems and networks. Until recently, most aspects of penetration analysis involved ad hoc means of unauthorized retrieval, corruption, or denying access to data and services. His research in this area focuses on the penetration analysis models, which would allow early detection of design and implementation errors that lead to successful penetration.

Professional Service

J. of Computer Security Editorial Board; Session Chair, High-Fidelity Crypto Protocols, DIMACS Workshop on Cryptographic Protocols; 13th Computer Security Applications Conf. Program Committee; Naval Research Laboratory Research Review Panel, Information Technology Division; INFOSEC Science and Technology Study Group; Chair, DARPA ISAT.

University Service

Electrical Engineering: Undergraduate Studies Committee; Graduate Studies and Research Committee; Promotion and Tenure Committee; Post-Tenure Review Committee; PhD/MS Qualify-

ing/Comprehensive Exam Committee.

Recent Publications

V. Gligor and S.-P. Shieh, "On a Pattern-Oriented Model for Intrusion Detection," *IEEE Trans. on Knowledge and Data Engineering*, vol. 9, no. 4, pp. 661-667, July/August 1997.

S. Gupta, S. Chandersekaran, V. Gligor, S. Malik, M. Muresan and D. Shankar, "Towards a Framework-based Solution to Cryptographic Key Recovery," *Proc. Public-Key Solutions Conf.*, pp. 1-12, Toronto, Canada, April 1997.

V. Gligor, "Characteristics of Role-Based Access Control," *Proc. 1st ACM Workshop on Role-Based Access Control*, (Youman, Sandhu, Coyne (eds.), vol. II, pp. 9-14, Gaithersburg, Md., Dec. 1995.

Julius Goldhar

Professor,
Ph.D., Massachusetts Institute of Technology.
Optical Society of America Fellow.

Research Interests

Dr. Goldhar is conducting research in the field of laser-matter interactions and nonlinear optics, as well as the development of opto-electronic devices such as Pockels' cells for inertial confinement fusion laser system. Recently, he became involved in research on the applications of nonlinear optics to in-fiber signal processing at very high data rates. He is working on new techniques for optical data generation, regeneration, clock recovery and header recognition. He is also involved in research on optical techniques for the generation and detection of terahertz radiation.

Professional Service

Topical Ed., *Applied Optics*, Lasers and Photonics Section.

University Service

Elecrtrical Engineering: General Academic Affairs Committee; Distinguished Lecturer Series Coordinator.

Recent Publications

J. S. Wey, D. L. Butler, N. W. Rush, G. L. Burdge and J. Goldhar, "Optical Bit-Pattern Recognition by use of Dynamic Gratings in Erbium-doped Fiber," *Optics Lett.*, vol. 22, no. 23, pp. 1757-1759, Dec. 1997.

P. S. Cho, D. Mahgerefteh, J. Goldhar and G. L. Burdge, "RZ Wavelength Conversion with Reduced Power Penalty Using a Semiconductor-Optical-Amplifier/Fiber-Grating Hybrid Device," *IEEE Photonics Tech. Lett.*, vol. 10, no. 1, pp. 66-68, Jan. 1998.

D. Mahgerefteh, P. Cho, J. Goldhar and G. L. Burdge, "Technique for Suppression of Pattern Dependence in a Semiconductor-Optical-Amplifier Wavelength Converter," *IEEE Photonics Tech. Lett.*, vol. 9, no. 12, pp. 1583-1585, Dec. 1997.

D. L. Hatten, J. Zhu, J. Goldhar, W. T. Hill, III, "Above Threshold Disociation of CO^{+2}" *Laser Physics*, vol. 7, no. 3, pp. 858-862, May-June 1997.

J. S. Wey, J. Goldhar, G. L. Burdge, "Active Harmonic Modelocking of and Erbium Fiber Laser with Intracavity Fabry-Perot Filters," *J. of Lightwave Tech.*, vol. 15, no. 7, pp. 1171-1178, July 1997.

J. J. Chen, F. S. Choa, P. S. Cho, J. S. Wey, J. Goldhar D. L. Butler and G. L. Burdge, "The Gain Decompression Effect and its Applications to Very Fast Wavelength Conversions," *IEEE Photonics Tech. Lett.*, vol. 9, no. 6, pp. 755-757, June 1997.

D. Mahgerefteh, P. Cho, J. Goldhar and G. L. Burdge, "Elimination of Pattern Dependence in a Semiconductor-Optical-Amplifier Wavelength Converter Using a Fiber Grating," *11th Intl. Conf. on Integrated Optics and Optical Fibre Communications 23rd European Conf. on Optical Comm.*, IOOC-ECOC'97 (Conf. Pub. no. 448) vol. 2, pp. 273-6, Edinburgh, UK, September 1997.

H.-Y. Yu, D. Mahgerefteh, P. Cho, J. Goldhar, and G. L. Burdge, "Imrpoved Frequency Response of a Semiconductor-Optical-Amplifier Wavelength Converter Using a Fiber Bragg Graing," *1997 Digest of the IEEE/LEOS Summer Topical Meetings: Vertical-Cavity Lasers/ Technologies for a Global Information Infrastructure/WDM Components Technology/Advanced Semiconductor Lasers and Applications/Gallium Nitride Materials, Processing, and Devices* (Cat. no. 97TH8276), Montreal, Quebec, August 1997.

Neil Goldsman

Associate Professor,
Ph.D., Cornell University.
Joint Appointment with ISR.

Research Interests

Professor Goldsman's research activities are in the areas of new electronic devices, circuits and materials. The major objectives of his research are to develop computer models which help to optimize the performance and reliability of new devices and circuits. His main emphasis has been in developing new physics-based mathematical approaches to semiconductor device simulation, where he has made contributions to the Monte Carlo, Hydrodynamic, and Numerical Boltzmann techniques. He is one of the originators of the Spherical Harmonic/Legendre Polynomial approach to sub-micron device analysis, which has application in predicting hot-electron effects in semiconductors. He is also working on Ion Implantation for sub-micron device fabrication, and is developing models for predicting electro-migration in integrated circuits. He is very active in undergraduate and graduate education – where he has developed new courses, and is helping to revise the curriculum to satisfy the needs of modern engineering students.

Professional Service

Semiconductor Industry Association (SIA) roadmap meeting, invited participant. Organized a short course with Purdue, University of Texas-Austin, University of Maryland and University of Illinois, titled "Hierarchical Device Simulation via a Web-Based Simulation Laboratory."

University Service

Electrical Enginereing : Dept. APT Committee; Salary Committee; Director of Undesignated Degree Program in Engineering; Liaison between EE Dept. and Motorola for their University Support Program. Gemstone Planning and Executive Committees; ISR Education Committee; Eta Kappa Nu Faculty Advisor.

Recent Publications

C.-C. Shen, J. Murguia, N. Goldsman, M. Peckerar, J. Melngailis and D. Antoniadis, "Use of Focused-Ion-Beam and Modeling to Optimize Submicron MOSFET Characteristics," *IEEE Trans. on Elec. Dev.*, vol. 45, pp. 453-459, 1998.

W. Wang, C. Chang, I. Berry, D. Ma, M. Peckerar, N. Goldsman and J. Melngailis, "Self-Aligned Subchannel Implant Complemetary Metal-Oxide Semiconductor Devices Fabrication," *J. of Vacuum Sci. Tech.*, vol. B15(16), pp. 2816-2820, 1997.

C.-H. Chang, C.-K. Lin, W. Liang, N. Goldsman, I. D. Mayergoyz, P. Oldiges and J. Melngailis, "The Spherical Harmonic Method: Corroboration with Monte Carlo and Experiment," *Proc. Intl. Conf. on Simulation of Semiconductor Processes and Devices*, pp. 225-228, 1997.

W. Wang, C. Chang, M. Peckerar, I. Berry, N. Goldsman and J. Melngailis, "Self-Aligned Sub-Channel Implant CMOS Devices Fabrication," *Proc. 41st Intl. Conf. on Electron, Ion and Photon Beam Tech.*, pp. 120-121, May 1997.

M. S. Krishnan, N. Goldsman and A. Christou, "Numerical Simulation of AlGaN/GaN Heterojunction Field Effect Transistors," *Abstracts of Materials Research Society Fall 1997 Symposium*, p. 380, Boston, Mass., 1997.

C. H. Chang, C.-K. Lin, N. Goldsman and I. D. Mayergoyz, "Spherical Harmonic Analysis of a 0.05μm Base BJT: Monte Carlo-Type Results But a Thousand Times Faster," *5th Intl. Workshop on Computational Electronics, Conf. Pgm.*, p. ThP8, May 1997.

Romel Del Rosario Gomez

Assistant Professor, Ph.D., University of Maryland.

Research Interests

Prof. Gomez' current research interests are in the general areas of surface magnetism and scanned probe instrumentation, with emphasis on magnetic recording and magnetic sensing. The general research theme is to understand the largely unexplored regime of magnetism at the nanoscale regime by developing and using local proximal techniques such as the scanning tunneling and force microscopes for imaging magnetic microstructures.

An area Prof. Gomez is interested in is "Nanostructured Materials and Recording Media." Nanostructured magnetic materials, such as ferromagnetic single crystals, alloys and metal oxides are regarded as important candidates for use in the next generation of magnetic data storage systems. His magnetics group is interested in establishing the micromagnetic properties of these materials, particularly the distribution of local coercivity, thermal stability, domain wall dynamics, switching characteristics and magneto-transport effects – in order to assess the design parameters in fabricating future high performance magnetic devices. Concurrently, microscopic studies of conventional recording media are also underway, and these are geared towards erasure processes, overwrite edge effects, tracking misregistration and effects at increased data densities.

Another area he is interested in is "Magnetic Force Microscopy: Quantification and Instrumentation Development." Magnetic force microscopy (MFM) has emerged as one of the most useful techniques in investigating micromagnetism. In this method, the images are acquired by measuring changes in the cantilever response, such as phase or frequency shift, as a function of lateral position. The magnetics group has several programs aimed at enhancing the utility of the technique. Among these are the development of methods for quantifying the instrument response, based upon the equivalence of electrostatic and magnetic forces. Likewise, MFM probes are being refined with the goal of improving the resolution and sensitivity performance by at least an order of magnitude from present levels. Finally, magnetic proximal probe microscopes that operate under ultra-high vacuum conditions, compatible with industrial device fabrication lines, are being designed and built. The approach is to adopt "magnetic force scanning tunneling microscopy" for UHV application– a technique that the group developed in recent years for ambient operation.

More information can be found at URL: http://www.ee.umd.edu/rdgomez.

Professional Service

Publications Chair, Intermag 2000 Conf.; *IEEE Trans. on Magnetics* Ed. Board; Session Chair, Joint MMM-Intermag Conference '98; Program Committee Member and Ed., Intermag '97 Conference; Treasurer, Philippine American Association of Scientists and Engineers.

University Service

Founding Advisor, Harmonics Coalition; Campus Senate Student Affairs Committee; Graduate Studies and Research Committee; General Academic Affairs Committee; Advisor, IEEE student association.

Recent Publications

C. Kwon, S.E. Lofland, S.M. Bhagat, M. Rajeswari, T. Venkatesan, R.Ramesh, A.R. Kratz and R.D. Gomez, "Stress-Induced Effects on Epitaxially Grown LSMO Metal Oxide Thin Films," *J. of Mag. and Magn. Matl.* vol. 172, pp. 229-233, Aug. 1997.

S. Zhu, R.J. Gambino, M.H. Rafailovich, J. Sokolov, S.A. Schwarz and R.D. Gomez, "Microscopic Magnetic Characterization of Submicron Cobalt Islands Prepared Using Self-Assembled Polymer Masking Tech-

nique," *IEEE Trans. on Magn*., vol. 33, pp. 3022-3024, Sept. 1997.

R. Madabhushi, R.D. Gomez, E.R. Burke, I.D. Mayergoyz, and J. Orloff, "Inter-track Interference Studies Using MFM Image Reconstruction," *IEEE Trans. on Magn*., vol. 33, pp. 4053-4055, Sept. 1997.

C. Kwon, S.E. Lofland, S.M. Bhagat, M. Rajeswari, T. Venkatesan, R.Ramesh, A.R. Kratz and R.D. Gomez, "Surface Magnetization of (La0.7Sr0.8)MnO3 Thin Films," *IEEE Trans. on Magn*., vol. 33, pp. 3964-3966, Sept. 1997.

R. D. Gomez, A. O. Pak, A. J. Anderson, E. R. Burke, A. J. Leyendecker and I. D. Mayergoyz, "Quantification of Magnetic Force Microscopy Images Using Combined Electrostatic and Magnetostatic Imaging," *9th Joint MMM-Intermag Conference, Journal of Applied Phys.,* vol. 83, pp. 6226-6228, 1998.

Victor L. Granatstein

Professor,
Ph.D., Columbia University.
IEEE Fellow;
American Physical Society Fellow;
Director, IPR; Joint Appointment with IPR.

Research Interests

Dr. Granatstein's research interests are in the area of relativistic microwave electronics, especially gyrotrons and free electron masers with application to plasma heating in magnetic fusion energy (MFE) research, advanced particle accelerators for high energy physics (HEP) research, microwave processing of materials, millimeter-wave radar systems, and unconventional electronics warfare (EW).

His current research interests are focused on developing gyrotron amplifiers and oscillators which operate efficiently at harmonics of the electron cyclotron frequency and are of particular interest in the HEP, radar, and EW applications. The approach being investigated is harmonic multiplication at each successive stage of a multi-stage gyrotron circuit; harmonic multiplication reduces the magnetic field in the gyrotron and thus avoids the requirement of using superconducting magnets. Employing multi-stage, depressed collectors to enhance gyrotron efficiency is also being investigated. Studies of plasma-filled backward-wave-oscillators and traveling-wave-amplifiers are being pursued on a path to developing more compact high-power-microwave tubes without the need of magnets for electron beam focusing. Finally, the basic phenomenology of microwave sintering of ceramics is being studied with the aim not only of improving sintering technology, but also of producing ceramics with superior mechanical and electrical properties.

Professional Service

Chair, Organizing Committee 8th Workshop on Advanced Accelerator Concepts; Chair, Intl. Advisory Committee, 22nd Intl. Conference on Infrared and Millimeter Waves; Chair, Intl. Advisory Committee, Workshop on Cyclotron-Resonance Masers and Gyrotrons; Chair, Human Rights Subcommittee of the IEEE Plasma Science and Application Committee; IEEE Nuclear and Plasma Sciences Society Administrative Committee; Guest Ed., *Proc. IEEE on New Vistas in Vacuum Electronics*; Special Reviewer, Council for Intl. Exchange of Scholars (Fulbright Senior Scholar Awards); Editorial Board, *Particle Accelerators.*

University Service

Director, Institute of Plasma Research; Chair of APT Committee, Clark School of Engineering. Electrical Engineering: Chair, Human Relations and Welfare Committee; Graduate Studies and Research Committee; Salary Committee.

Recent Publications

V. L. Granatstein, B. Levush, B. Danly and R. K. Parker, "A Quarter Century of Gyrotron Research and Development," *IEEE Trans. Plasma Sci*., vol. 25, pp. 1322-1335, 1997.

H. Guo, V. L. Granatstein, S. H. Chen, J. Rodgers, G. Nusinovich, M. Walter, B. Levush and and W. J. Chen, "Operation of a Highly Overmoded, Harmonic-Multiplying, Wideband Gyrotron Amplifier," *Phys. Rev. Lett*., vol. 79, pp. 515-518, 1997.

K. R. Chu, H. Guo and V. L. Granatstein, "Theory of the Harmonic Multiplying Gyrotron Traveling Wave Amplifier," *Phys. Rev. Lett*., vol. 78, pp. 4661-4664, 1997.

A. Singh, D. S. Weile, S. Rajapatirana and V. L. Granatstein, "Integrated Design of Depressed Collectors for Gyrotrons", *IEEE Trans. Plasma Sci*., vol. 25, pp. 480-491, 1997.

G. S. Nusinovich, G. P. Saraph and V. L. Granatstein, "Scaling Law for Ballistic Bunching in Multicavity Harmonic Gyroklystrons," *Phys. Rev.Lett*., vol. 78, pp. 1815-1818, 1997.

H. P. Freund and V. L. Granatstein, "Long Wavelength Free Electron Lasers in 1996," Nucl. Instrum. *Meth. Phys. Res*., vol. A393, pp. 9-12, 1997.

G. P. Sarpah, V. L. Granatstein and W. Lawson, "Design of a Single-Stage Depressed Collector for High-Power, Pulsed Gyroklystron Amplifiers," *IEEE Trans. Electron Devices*, vol. 45, pp. 986-990, 1998.

J. M. Taccetti, R. H. Jackson, H. P. Freund, D. E. Pershing and V. L. Granatstein, "The Wideband Input Coupler for a Low Voltage, Ka-band, Co-axial Ubitron Amplifier," *Nucl. Instrum. Meth. Phys. Res*., vol. A393, part II, pp. 79-80.

W. Lawson, J. Anderson, J. P. Calame, J. Cheng, M. Castle, V. L. Granatstein, B. Hogan, M. and G. P. Saraph, "High Power Gyroklystron Development for Advanced Accelerator Applications," *Proc. 7th Workshop on Advanced Accelerator Concepts*, pp. 865-873, Lake Tahoe, CA, October 1998.

J. M. Taccetti, R. H. Jackson, H. P. Fruend, D. E. Pershing and V. L. Granatsein, "Progress on a Ka-Band CHI Wiggler Ubitron Amplifier," *Digest of the 22nd Intl. Conf. on Infrared and Millimeter Waves*, pp.7-8, Wintergreen, VA, July 1997.

A. Singh, R. Rajapatirana and V. L. Granatstein, "A New Algorithm for Tracing Back-Scattered Electrons," *ibid*., pp. 190-191.

R. L. Ives, Y. Mizuhara, R. Schumacher, A. Singh, R. Rajapatirana and V. L. Granatstein, "Design of a Multi-Stage Depressed Collector for a 1 MW CW Gyrotron," *ibid*., pp. 196-197.

W. Lawson, J. P. Calame, M. Castle, J. Cheng, V. L. Granatsein, B. Hogan, M. Reiser and G. P. Saraph, "Operation of a Two-and Three-Cavity First Harmonic Coaxial X-Band Gyroklystrons," *ibid*., pp. 237-238.

G. S. Nusinovich, G. P. Saraph and V. L. Granatstein, "Scaling Laws for Ballistic Bunching in Multicavity Gyroklystrons," *ibid.,* pp. 239-240.

H. Guo, S. H. Chen, V. L. Granatstein, J. Rodgers, G. Nusinovich, B. Levush, M. Walter and W. J. Chen, "A High Performance, Frequency Doubling, Inverted Gyrotwystron," *ibid*., pp. 285-286.

G. Nusinovich, M. Walter, V. L. Granatstein, "Theory of the Inverted Gyrotwystron," *ibid*., pp. 287-288.

K. Mininami, K. Tanaka, X. D. Zheng, Y. Carmel, A. Vlasov and V. L. Granatstein, "Oscillation of TE11 Mode from a High Power Backward Wave Oscillator," *ibid*., pp. 311-312.

Robert O. Harger

Professor Emeritus,
Ph.D., University of Michigan.
IEEE Fellow

Research Interests

Dr. Harger's research, scholarly, and teaching interests are in the general areas of communication and digital signal and image processing. He recently published an introductory book on digital signal processing, written in an interactive, high-level mathematical programming language. He is presently using the book in a computer classroom and introducing other innovative teaching methods.

James A. Hendler

Affiliate Associate Professor,
Ph.D., Brown University.
Joint Appointments with Computer Science, ISR, and UMIACS.

Research Interests

Information technology puts new demands on artificial intelligence (AI) technologies. Dr. Hendler's research focuses on providing supporting technologies and working prototypes for using AI in smarter search engines, agent-based systems, and scientific and medical research. These sorts of applications require scaling AI way beyond current bounds, and Dr. Hendler's research accordingly concentrates on on the building and efficient use of very large knowledge bases (using high performance computing techniques), the integration of knowledge- and data-based techniques for creating hybrids with the inferencing capabilities of AI coupled with the memory-management and ease-of-use features of DBMS systems, the creation of very large case-based reasoners, and the exploration of "situated planning" systems as the basis of intelligent agent systems.

Some of the projects Dr. Hendler is working on include: High Performance Case-Based Planning; Hierarchical Task Network Planning: Formalization and Analysis; Hybrid Symbolic/ Connectionist Research; Intelligent Tutoring System for Arabic and Spanish; Parallel Knowledge Representation (PARKA system); and Real-Time A.I. Systems.

Professional Service

Program Manager, Software and Systems Program Mathematical and Geosciences Directorate, US Air Force Research Laboratory, Air Force Office of Scientific Research; Special Task Force on Ballistic Missile C4I, POET study for Ballistic Missile Defense Organization; Member, Defense Science Study Group, Arpa/IDA; US Air Force Science Advisory Board; Chair, ACM Awards Doctoral Dissertation Prize Committee; AAAS Science Journalism Awards Screening Committee; Program Chair, National Conf. on Artificial Intelligence (AAAI '99); Dagstuhl Seminar Co-chair, Dagstuhl Seminar on Control of Search in AI Planning; Intl. Conference on Knowledge Representation (KR96) Program Committee; Intl. Conf. on Case-based Reasoning Program Committee; National Conference on AI (AAAI) Senior Program Committee; Executive Council, AI Planning Systems Conference.

University Service

Intl. Affairs Committee; Gemstone Advisory Committee; Gemstone Mentor.

Recent Publications

J. A. Hendler, K. Erol and D. Nau, "Complexity Results for Hierarchical Task-Network Planning," *Annals of Mathematics and Artificial Intelligence*, vol. 18, no. 1, 1997.

S. Luke and J. A. Hendler, "Web Agents that Work," *IEEE Multimedia*, vol. 4, no. 3, 1997.

O. Seeliger and J. A. Hendler, "Supervenient Hierarchies of Behaviors in Robotics," *J. of Experimental and Theoretical AI* , vol. 9, Nos. 2/3, 1997.

J. A. Hendler, V. Manikonda and P. S. Krishnaprasad "Languages, Behaviors, Hybrid Architectures and Motion Control," *Essays in Mathematical Control Theory* (in honor of the 60th birthday of Roger Brockett), John Baillieul and Jan C. Willems, eds., Springer-Verlag.

A. Wilson and J. Hendler, "Conncert: A Modular Approach to the Design of Connectionist Archtectures," *Progress in Neural Network*, C. Wilson, ed., Ablex, NJ, 1997.

K. Stoffel and J. A. Hendler, "Parka on MIMD-Supercomputers," *Parallel Processing in AI*, J. Geller, ed., 1997.

K. Stoffel, J. Saltz, J. A. Hendler, J. Dick, W. Merz and R. Miller, "Semantic Indexing for Complex Patient Grouping," *Proc. Annual Conf. of the American Medical Informatics Association*, Oct. 1997.

L. Nunes de Barros, R. Benjamins and J. A. Hendler, "Par-kap: A Knowledge Acquisition Tool for Building Practical Planning Systems," Proc. IJCAI-97, Nagoya, Japan, 1997, reprinted in *Proc. Ninth Dutch Conf. on Artificial Intelligence (NAIC-97)*, K. van Marcke, W. Daelemans, eds., University of Antwerp, Belgium, November, 1997.

K. Stoffel, M. Taylor, and J. A. Hendler, "Efficient Management of Very Large Ontologies," *Proc. AAAI-97*, Providence, RI, 1997.

D. Rager, J. A. Hendler, and A. Mulvehill, "ForMAT and Parka: A Technology Integration Experiment and Beyond," *Proc. Intl. Conf. on Case-Based Reasoning*, Providence, RI, 1997.

B. Kettler, K. Sanders and J. A. Hendler, "The Case for Graph-Structured Representations," *Proc. Intl Conf. on Case-Based Reasoning*, Providence, RI, 1997.

S. Luke, J. A. Hendler, L. Spector and D. Rager, "Ontology-Based Web Agents," *Proc. Agents 1997*, San Mateo, CA. 1997.

J. A. Hendler, P. Emmerman and V. S. Subrahmanian, "CATS: An Architecture for Scalable Intelligent Agent Applications," *Bar-Ilan Symposium on the Foundations of Artificial Intelligence*, Israel, 1997.

J. A. Hendler, "Developing Intelligent Agents–The future of AI Planning Systems," invited talk, *3rd Brazilian Symposium on Intelligent Automation*, Vitoria, Brazil, Sept., 1997.

Ping-Tong Ho

Professor,
Sc.D., Massachusetts Institute of Technology.

Research Interests

Dr. Ho's research interests are in lasers and optics, microwaves, and semiconductor devices. He is working on spatial light modulators, laser rangers, optical filters, and standards for optical near field microscopy. He and a student, working with a government laboratory, are designing and fabricating an optically addressable spatial light detector array which uses semiconductor detectors to control liquid crystal modulators. They have achieved record low dark currents and capacitances in the semiconductor detectors, crucial requirements for the modulator design, and have seen optical-optical modulation. A simple, accurate, absolute ranger is being developed in collaborating with a local company. The ranger uses a variation of the time-of-flight technique, resulting in high accuracy (0.1 mm over 20 meters) with simple, low-speed electronics. A new project is underway to design and fabricate wavelength-scale optical filters for applications in wavelength-divisional-multiplexed communication systems. A calibration standard for near field optical microscopy is being developed together with NIST.

University Service

Electrical Engineering: Newsletter Coordinator; Coordinator for Visiting Scholars.

Recent Publications

Y. C. Liu, P. R. Barbier, F. G. Johnson, P.-T. Ho and G. L. Burdge, "InGaAs Photodiodes for Infrared-Sensitive Optically Addressed Spatial Light Modulators," *Optical Society of America, Spec. Topics*, vol. 14, pp. 138-140, 1997.

Jeffrey K. Hollingsworth

Affiliate Assistant Professor,
Ph.D., Computer Sciences, University of Wisconsin.
Joint Appointememt with Computer Science.

Research Interests

Dr. Hollingsworths research seeks to exploit runtime observations of the behavior of parallel and distributed systems to improve application and system performance. Although static analysis can provide significant insights into how applications will behave when executed, programs today are so complex that to fully understand their performance, they must be executed and measured.

To help programmer makes these tuning choices, Dr. Hollingsworth is developing techniques to evaluate the potential of different tuning options to improve application execution before the programmer changes a single line of code. One example of this technique is online Critical Path Zeroing which lets a programmer consider the potential impact of tuning specific procedures on the overall performance of the computation. A second technique, called load balancing factor, evaluates the potential of moving work between processors instead of reducing the amount of work to be done.

To facilitate the creation of runtime measurement and adaptation tools, Dr. Hollingsworth has developed dyninst, a C++ class library to permit platform independent runtime executable editing. Unlike previous binary rewriting tools, dyninst permits programs to be changed during program execution. Runtime modification of program executables is useful for performance measurement, efficient data breakpoints, performance steering, and architecture studies.

In the Harmony project, Dr. Hollingsworth is using observations of the runtime behavior of parallel and distributed systems to move from

measuring bottlenecks and predicting tuning options to automatically adapting a running system to try to improve it performance.Applications and system software often contain a rich set of parameters that can influence performance. However, the most appropriate algorithm or configuration is dependent on information available only at runtime. In this area, he is exploring how performance measurement can be used to adapt programs during execution to create applications that adapt and change during their execution to improve their performance.

Finally, Dr. Hollingsworth has been working in the area of configuration management of compiled software artifacts (programs, libraries, icons, etc.). Managing software objects is a growing problem as software reuse becomes more prevalent. For an application composed from reused libraries and modules to function correctly, all of the required files must be available and be the correct version. We have developed a simple scheme to address this problem: content-derived names (CDNs). A content-derived name is a unique identifier that can automatically be computed using digital signatures. By using content-derived names, de velopers can ensure that only those software components that have been tested together are permitted to run together. The system permits multiple versions of shared components to co-exist on a single system, and be automatically deleted when all applications that depend on them have been upgraded (or deleted).

Professional Service

Program Committee Co-Chair, 1998 ACM SIGMETRICS Symposium on Parallel and Distributed Tools; 1998 IEEE Real-Time Systems Symposium Program Committee.

University Service

Chair, CS Department Computer Facilities Committee; 1998 UMD High School Programming Contest Judge.

Recent Publications

J. K. Hollingwsorth, B. P. Miller, "Instrumentation and Measurement," *The Grid: The Future of High-Performance Distributed Computing*, K. Kesselman and I. Foster, ed., Morgan-Kaufmann, 1998.

A. Whaeed, D. T. Rover, and J. Hollingsworth, "Modeling and Evaluating Design Alternatives for an On-Line Instrumentation System: A Case Study," *IEEE Trans. on Software Engineering*, 1998.

J. K. Hollingsworth, E. Guven, and C. Akinlar, "Benchmarking a Network of PCs Running Parallel Applications," *IEEE Intl. Performance, Computing, and Communications Conf.*, pp. 1-7, Tempe, Arizona, Feb. 1998.

J. K. Hollingsworth, B. P. Miller, M. J. R. Gongalves, O. Naim, Z. Xu and L. Zheng "MDL: A Language and Compiler for Dynamic Program Instrumentation," *Intl. Conf. on Parallel Architectures and Compilation Techniques*, pp. 201-212, San Francisco, CA, Nov. 1997.

J. K. Hollingsworth and E. L. Miller, "Using Content-Derived Names for Configuration Management," *ACM Symposium on Software Reusability*, pp. 104-109, Boston, MA, May 1997.

Agis Iliadis

Associate Professor, Ph.D., Manchester University (UMIST), United Kingdom.

Research Interests

Dr. Iliadis' research interests are in the areas of Molecular Beam Epitaxial (MBE) growth, microelectronic devices and monolithic integration of elemental and compound semiconductors with applications in low power communication modules, microwave modules, and microactuators.

His current research is focused on developing application specific devices, high performance MODFET's and heterojunction bipolar transistors, based on AlGaAs/GaAs and InGaAs/AlInAs/InP, high frequency SOI MOSFET's and the monolithic integration of MOS compatible Si and SOI based transceivers and optoelectronic devices for communication and computer networks.

Professional Service

Session Chair, Intl. Semiconductor Devices Research Symposium (ISDRS'97).

University Service

Tenure and Promotions Committee; College of Engineering Council.

Recent Publications

A. A. Iliadis, S. N. Adronescu, K. Edinger, J. Orloff, V. Talyansky, R. D. Vispute, R. P. Sharma, T. Venkatesan, M. C. Wood and K. Jones, "Power Semiconductor Materials and Devices," edited by S. J. Pearton, R. J. Shul, E. Wolfgang, F. Ren and S. Tenconi, *MRS*, vol. 483, 1998.

V. Talyansky, R. D. Vispute, R. P. Sharma, S. Choopun, M. Downes, T. Venkatesan, S. N. Andronescu, A. A. Iliadis, Y. X. Li, L. G. Salamanca-Riba, M. C. Wood, R. T. Lareau and K. A. Jones, "Power Semiconductor Materials and Devices," edited by S. J. Pearton, R. J. Shul, E. Wolfgang, F. Ren and S. Tenconi, *MRS*, vol. 483, 1998.

V. Talyansky, R. D. Vispute, R. P. Sharma, S. Choopun, M. Downes, T. Venkatesan, A. A. Iliadis, M. C. Wood, R. T. Lareau and K. A. Jones, "Expitaxial Oxide Thin Films III," C. Foster, J. S. Speck, D. Schlom, C. B. Eom and M. E. Hawley, eds., *MRS*, vol. 474, p. 119, 1997.

R. D. Vispute, V. Talyansky, R. P. Sharma, S. Choopun, M. Downes, T. Venkatesan, K. A. Jones, A. A. Iliadis, M. A. Khan and J. W. Yang, " "Growth of Expitaxial GaN Films by Pulsed Laser Deposition," *Appl. Phys. Lett.*, vol. 71, no. 1, pp. 102-104, 1997.

R. D. Vispute, V. Talyansky, S. Choopun, M. Downes, R. P., Sharma, T. Vekatesan, M. C Wood, R. T. Lareau, K. A. Jones and A. A. Iliadis, "Growth of Expitaxial ZnO Films on Sapphire by Pulsed Laser Deposition," *Appl. Phys. Lett.*, vol. 70, p. 2735, 1997.

A. A. Iliadis, S. Andronescu, V. Talyansky, K. Edinger, J. Orloff, M.

Woods and K. A. Jones, "Focused Ion Beam Assisted Ohmic Metallizations to p-SiC," *Proc. 24th Intl. Symp. on Compound Semiconductors (ISCS '97)*, San Diego, Calif., Sept. 1997.

A. A. Iliadis, S. N. Andronescu, K. Edinger, J. Orloff, V. Talyansky, R. D. Vispute, R. P. Sharma, T. Venkatesan, M. C. Wood and K. A. Jones, "PLD Epitaxial TiN and Pt Ohmic Contacts to p-type 6H-SiC Using Focused Ion Beam Surface Modification," *Proc. MRS '97 Fall Meeting, Symp. E*, Boston, Mass., 1997.

V. Talyansky, R. D. Vispute, R. P. Sharma, S. Choopun, M. Downes, T. Venkatesan, S. N. Andronescu, A. A. Iliadis, Y. X. Li, L. G. Salamanca-Riba, M. C. Wood, R. T. Lareau, and K. A. Jones, "PLD of TiN Expitaxial Contacts on 6H-SiC and GaN," *Proc. MRS '97 Fall Mtg., Symp. E*, Boston, Mass., 1997.

A. A. Iliadis and A. Caviglia, "Self-Heating in SOI MOSFETs and the Extraction of Isothermal Characteristics from Small-Signal Measurements," *Proc. Intl. Semiconductor Devices Research Symposium (ISDRS '97)*, Charlottesville, Va., 1997.

Bruce Jacob

Assistant Professor, Ph.D., University of Michigan.

Research Interests

Dr. Jacob's research interests are in the areas of computer architecture, cache and memory-system design, embedded systems, and memory management. The objectives of his research are to build hardware/software systems that improve the performance, cost, real-time behavior, and/or power consumption of processor designs relative to existing designs. The techniques he uses include system modeling and simulation, in which one builds a computer program that emulates the behavior of the system under observation. This allows one to study arbitrarily complex hardware architectures that might be too expensive or difficult to build in silicon.

His present research projects at the University of Maryland focus on embedded systems and mainstream computer architecture. The more traditional computer architecture projects include the analysis of DRAM architectures for improved memory-system performance, which is one of the first in-depth comparisons of different DRAM technologies. This research aims to reduce the gap between processor and memory performance. He is also developing interrupt mechanisms that better suit the behavior of high-performance out-of-order superscalar processors, which have relatively complex mechanisms that undo the effects of dynamic scheduling in the rare case of an interrupt. His memory-management research looks into the simplification of memory-management hardware to obtain a more standard, software-oriented approach to virtual memory that provides better performance and more flexibility than hardware-oriented designs.

He is also working in the area of embedded-systems computer architecture; these embedded systems projects include the development of real-time mechanisms at the microarchitecture level and the re-design of a real-time operating system to take advantage of the novel mechanisms. This work in architectures for real-time processing should speed up real-time systems significantly and allow systems with even moderate processing power to make tight deadline requirements. He is also developing a CAD tool to automate the exploration of core-based ASIP designs (Application-Specific Instruction-set Processors). This tool will allow designers of embedded/DSP systems to quickly customize commercial core-based ASIP offerings to the needs of their applications.

University Service

Electrical Engineering Faculty Search Committee

Recent Publications

B. L Jacob and T. N. Mudge, "Software-Managed Address Translation," *Proc. Third Intl. Symposium on High Performance Computer Architecture (HPCA-3)*, pp. 156-167, San Antonio TX, February 1997.

B. L. Jacob, P. M. Chen, S. R. Silverman, and T. N Mudge, "A Comment on 'An Analytical Model for Designing Memory Hierarchies'," *IEEE Trans. on Computers*, vol. 46, no. 10, p. 1151, October 1997.

Joseph F. JáJá

Professor, Ph.D., Harvard University. IEEE Fellow; Director, UMIACS; Joint Appointments with Computer Science and ISR.

Research Interests

Dr. JáJá's research interests are in the general area of parallel and distributed computing, with a particular emphasis on distributed systems interconnected by high-speed networks. His current research activities are centered around three major efforts. The first is related to a Grand Challenge Project that aims at developing high-performance computing technology for the extraction of land cover information at the global level using multi-resolution, multi-spectral, and multi-temporal remote sensing imagery. This project emphasizes object oriented programming and parallel I/O of large-scale images and maps, as well as new parallel algorithms and systems for image processing and spatial data.

The second effort is based on the development of models and communication primitives that form the basis for writing applications code capable of making effective use of the available resources, and portable across various platforms. In particular, the increase in the number of processors available will result in a proportional speed-up in the execution time. This methodology has been implemented for a variety of

specific applications – including image processing, sorting, and list processing.

Finally, he is leading an effort to develop and integrate a computing infrastructure to support efficient and seamless access, discovery, generation, cross-correlation, and visualization of large scale earth system science data..

Professional Service

Subject Area Editor on Parallel Algorithms, *J. of Parallel and Distributed Computing*, Assoc. Ed., *IEEE Trans. on Parallel and Distributed Systems*; Symposium on Parallel Algorithms and Architectures Program Committee; Vice-Chair for Algorithms and Applications, Intl. Conf. on Parallel Processing, Program Committee; Intl. Parallel Processing Symposium Program and Steering Committees; IASTED Intl. Conf. on Parallel and Distributed Computing and Networks Program Committee; Intl. Conf. on High Performance Computing Program Committee.

University Service

Director, UMIACS; Indirect Cost Committee; Graduate Council Research Committee.

Recent Publications

J. F. JáJá, "Parallel Algorithms," *Encyclopedia of Distributed Computing*, P. Dasgupta and J. Urban eds., Kluwer, 1998.

H. Fallah-Adl J. F. JáJá and S. Liang, "Fast Algorithms for Estimating Aerosol Optical Depth and Correcting Thematic Mapper Imagery," *J. of Supercomputing*, vol. 10, no. 4, pp. 315-329, 1997.

S. Liang, H. Fallah-Adl, J. F. JáJá, S. Kalluri, Y. Kaufman, and J. Townshend, "Development of an Operational Atmospheric Correction Algorithm for TM Imagery," *J. of Geophysical Research*, vol. 102, no. D14, 117, pp. 173-17, 186, July 1997.

J. F. JáJá, S. Kalluri, S. Liang and J. Townshend, "Retrieval of Bidirectional Reflectance Distribution Function (BRDF) at Continental Scale from AVHRR Data Using High Performance Computing," *IGARSS Symposium*, with Z. Zhang, et al., August 1997.

J. F. JáJá and D. Helman, "Sorting on Clusters of SMPs," *Intl. Parallel Processing Symp.*, April 1998.

Peter Keleher

Affiliate Assistant Professor,
Ph.D., Rice University.
NSF CAREER Award;
Joint Appointments with Computer Science and UMIACS.

Research Interests

Keleher's research interests lie primarily in the field of distributed computing. The two primary thrusts of his current work are in distributed shared memory (DSM) and in global resource management in large-scale systems. The DSM work is aimed at finding the limits to high performance of software DSMs. This encompasses communication analysis, assessing the impact of protocol choices, and identifying environmental conditions and application domains for which software DSM makes sense.

The resource management work encompasses a large number of issues involved in executing parallel applications in large-scale, non-dedicated, possibly heterogeneous environments. Our current focus is on assessing the impact of global versus local information on scheduling decisions, designing flexible application/system interfaces, and on system-directed application adaptation.

Recent Publications

H. Han, C.-W. Tseng, and P. Keleher, "Reducing Synchronization Overhead for Compiler-Parallelized Codes on Software DSMs," *Languages and Compilers for Parallel Computing, Tenth Intl. Workshop,* (Z. Li et al., eds.), *Lecture Notes in Computer Science*, Springer-Verlag, 1997.

H. Han, C.-W. Tseng, and P. Keleher, "Reducing Synchronization Overhead for Compiler-Parallelized Codes on Software DSMs," *Workshop on Languages and Compilers for Parallel Computing (LCPC'97)*, August 1997.

K. Thitikamol and Pete Keleher, "Multi-Threading and Remote Latency in Software DSMs," *17th Intl. Conf. on Distributed Computing Systems*, May 1997.

Perinkulam S. Krishnaprasad

Professor,
Ph.D., Harvard University.
IEEE Fellow; Joint Appointment with ISR.

Research Interests

As a part of the NSF-ERC proposal effort, Dr. Krishnaprasad developed a program of research in Intelligent Processing of Materials (IPM), an area viewed as being of strategic importance. Specifically, the proposed effort includes model-based control of chemical vapor deposition, and a project on electro-mechanical motion control prototyping. Key aspects of these efforts include multi-university collaboration (Harvard, North Carolina State U.) and industry collaboration. He has initiated new real-time control experiments in the Intelligent Servo-Systems Laboratory, specifically related to smart actuators and sensors.

University Service

Electrical Engineering: Committee on Graduate Studies and Research; Ad-Hoc Committee on Post Tenure Review of Faculty. ISR: Executive Committee; APT Committee; Salary Committee.

Recent Publications

P. S. Krishnaprsad, "Motion Control and Coupled Oscillators," *Motion, Control and Geometry: Proceedings of a Symposium*, issued by Board on Mathematical Sciences, Commission on Physical Sciences, Mathematics, and Applications, of the National Research Council, National Academy of Sciences Press, pp 52-65, Washington D.C. (1997).

P. S. Krishnaprasad, V. Manikonda and J. Hendler, "Languages, Behaviors, Hybrid Architectures and Motion Control," in *Essays in Mathematical Control Theory*, J. Baillieul and J. C.

Willems, eds., Springer Verlag, New York, 31 pages. (1998).

P. S. Krishnaprsad and V. Manikonda, "Controllability of Lie-Poisson Reduced Dynamics" *Proc. 1997 American Control Conf.*, American Automatic Control Council, pp. 2203-2207, Philadelphia, Pa., 1997.

P. S. Krishnaprasad and H. Struemper, "On Approximate Inversion and Feedback Stabilization for Systems on Matrix Lie Groups," *Proc. 1997 American Control Conf.*, American Automatic Control Council, pp. 2576-2580, Philadelphia, Pa., 1997.

P. S. Krishnaprasad and H. Struemper, "Approximate Tracking for Systems on Three-dimensional Matrix Lie Groups via Feedback Nilpotentization," *Proc. Fifth IFAC Symp. on Robot Control (SYROCO'97)*, M. Guglielmi (ed.), pp. 25-32, Nantes, France, September, 1997.

P. S. Krishnaprasad and V. Manikonda, "Control Problems of Hydrodynamic Type," *IFAC Symposium on Nonlinear Control Systems (NOLCOS'98)*, invited paper for special session on Control of Underactuated Systems, at the Enschede, The Netherlands, 1998.

P. S. Krishnaprasad and R. Venkataraman, "A Model for a Thin Magnetostrictive Actuator," *Proc. 32nd Annual Conf. on Information Science and Systems*, Princeton University, March 1998.

Wesley G. Lawson

Professor,
Ph.D., University of Maryland.
Joint Appointment with IPR.

Research Interests

Dr. Lawson's research interests lie predominantly in the areas of relativistic electronics and high power microwave sources, components, and applications. His current research on microwave sources is concentrated on gyrotron amplifiers and novel hybrid slow wave/fast wave amplifiers. The gyrotron amplifier studies are intended to lead to devices with output powers above 100 MW for 1 microsecond, with gains and efficiencies exceeding 50 dB and 40%, respectively. The targeted frequency range is 8-30 GHz. Such devices will make suitable RF drivers for the next generation of linear colliders. The goal of the hybrid amplifier studies is to produce high efficiency, low magnetic field, low voltage, and narrow and broadband amplifiers for a variety of applications. This pioneering work utilizes non-adiabatic magnetic transitions to combine the benefits of slow wave and fast wave devices in a single microwave tube. The high power microwave component research includes theoretical and experimental work on the design of various overmoded coaxial and circular waveguide components. The list of hardware under investigation includes nonlinear waveguide transitions mode converters and injectors, directional couplers, filters, and absorbers.

Professional Service

1997 PAC Conf. Program Committee (RF Sub-committee chair); Ed., 8th Intl. Workshop on Advanced Accelerator Concepts conference record.

University Service

Electrical Engineering: Chair, Undergraduate Affairs Committee; Department Council; Salary Committee.

Recent Publications

A. Liu, W. Lawson, A. Fernandez, J. Rodgers and W. W. Destler, "Design of a Low-Voltage, Axially Modulated, Cusp-Injected, Third Harmonic, X-Band Gyrotron Amplifier Experiment," *IEEE Trans. Electron Dev.*, vol. 44, p. 2022, 1997.

W. Lawson, A. Fernandez, T. Hutchings and G. P. Saraph, "A Novel Hybrid Slow Wave/Fast Wave Traveling Wave Amplifier," *IEEE Trans. Plasma Sci.*, vol. 25, p. 1050, 1997.

G. P. Saraph, V. L. Granatstein and W. Lawson, "Design of a Single-Stage Depressed Collector for High Power Pulsed Gyroklystron Amplifiers," *IEEE Trans. Electron Dev.*, vol. 45, p. 986, 1998.

Chi H. Lee

Professor,
Ph.D., Harvard University.
IEEE Fellow; Optical Society of America Fellow; Photonics Society of Chinese-Americans Fellow.

Research Interests

Dr. Lee's research interests are in the area of ultrashort-pulse lasers and ultrafast optoelectronics. This includes all aspects of ultrashort-pulse lasers, from generation and characterization of optical pulses to a wide range of applications using ultrashort pulses.

His current research activities can be categorized into two groups: (1) ultrashort-pulse laser technology, and (2) RF optoelectronic applications using ultrafast optical techniques. In the laser technology area, several projects are being pursued. They include the development of a versatile, multi-use, ultrashort-pulse laser system for research in atomic, molecular, and optical science and engineering. The system will deliver picosecond through femtosecond pulses with variable repetition rate, tunable wavelength, and output energy up to 1 mj. RF optoelectronic applications include: optoelectronic RF wireless communication, optical control devices for millimeter-wave and phased array systems, on wafer optoelectronic characterization of MMICs, ultra-wide-band and terahertz radiation. In addition, he is also working on the high power ultrashort pulse semiconductor laser using multiple quantum well structures as the compact laser source for ultrafast photoconductive switching of circuit elements, optical pulse compression in linear and nonlinear fibers and opto-electronic high temperature superconductor devices.

Professional Service

Co-Chair, IEEE Microwave Photonics Meeting '98; LEOS'98 Technical Committee; *Microwave and Optical Technology Letters*, Ed. Board; President,

Photonics Society of Chinese-Americans.

University Service

New Asian Studies Program Program Steering Committee; Intl. Exchange Agreement Committee; China Committee. Electrical Engineering: Graduate Council; Graduate Studies Committee; Ad-Hoc Committee to review recommendations of Graduate Program Review Committee; Ward Chair Professorship Search Committee.

Recent Publications

W. L. Cao, S. Tachatraiphop, C. H. Lee, L. Yan and M. Wraback, "A Diode-Pumped Continuous Wave Hybrid Nd: Phosphate Glass and Nd:YVO_4 Laser," OSA TOPS, *Advanced Solid State Lasers*, C. R. Pollock and W. R. Bosenberg ed., vol. 10, pp. 158-161, July 1997.

Y. G. Zhao, S. B. Ogale, R. Shreekala, Z. W. Dong, S. P. Pai, M. Rajeswari, P. T. Venkatesan, W. L. Cao, W. Lu, and C. H. Lee, "Laser Power and Temperature Dependence of the Transient Photoimpedance Response of YBCO Thin Films," *J. Appl. Phys.*, vol. 83, pp. 1531-1535, February 1998.

E. E. Funk, L. J. Jasper, Jr., and C. H. Lee, "An Optoelectronic RF Burst Communications System," *OSA Ultrafast Electronics and Optoelectronics*, pp. 8-10, March 1997.

William S. Levine

Professor,
Ph.D., Massachusetts Institute of Technology.
IEEE Fellow.

Research Interests

Dr. Levine's research emphasizes two broad areas: control system design and the control of biomechanical systems. Specific current projects in control design include development of an interactive software package for the design of rotorcraft control systems, research on the computation of optimal controls, and research on robust control of spacecraft. Specific current projects in the control of biomechanical systems include development of a mathematical and computer-graphic model of the tongue and development of algorithms for interpolating data from ultrasound scans of the tongue into moving 3-dimensional images of the tongue's surface.

The research on control system design has the long-term goal of understanding the control of multi-input multi-output systems. Such systems are becoming more and more common as sensors and actuators become less expensive and as economic pressures drive system designers to try for greater and greater efficiency of operation.

The research on biocontrols is intended to contribute to the long-term goals of understanding how humans control their voluntary movements and of providing movement aids for individuals, such as those with cerebral palsy, who have some form of difficulty controlling their movements.

Professional Service

Assoc. Ed. at Large, *IEEE Trans. on Automatic Control.*

University Service

Chair, College-wide Control Laboratories Committee.

Recent Publications

W. S. Selbie, L. Zhang, W. S. Levine and C. L. Ludlow, "Using Geometry to Determine the Motion of the Cricoarytenoid Joint," *J. of Acoust. Soc. of Am.*, vol. 103, no. 2, pp. 1115-1127, February 1998.

C. C. Raasch, F. E. Zajac, B. Ma and W. S. Levine, "Muscle Coordination of Maximum Speed Pedaling," *J. Biomech.*, vol. 30, no. 6, pp. 595-602, 1997.

S. D. Yen and W. S. Levine, "Mixed $H_2H\infty$ Optimization: a BMI Solution," *Proc. 1997 IEEE CDC*, pp. 460-465, Dec. 1997.

M. B. Tischler, D. J. Biezad, W. S. Levine and V. Moldoveanu, "CONDUIT–A New Multidisciplinary Integration Environment for Flight Control Development," *AIAA Guidance, Navigation and Control Conf.*, 23 pages, August 1997.

Hung C. Lin

Professor Emeritus,
D.E.E., Polytechnic of Brooklyn.
IEEE Life Fellow.

Research Interests

Dr. H.C. Lin's research interests are in the general area of integrated circuits and semiconductor devices. His current interest is in the application of Resonant Tunneling Diodes (RTD) for multiple-valued digital circuit and fuzzy logic. RTDs have very high response and unique folding characteristics. The use of these devices can result in circuit simplification and high speed. RTD analog-to-digital converters and multi-valued memories have been developed.

During the past year, Dr. Lin has been engaged in and undergraduate student project to develop noise reduction circuits for headphones. The task was first conducted as an EE project, and later as a project for Research Internship for Telecommunication Engineering program under the sponsorship of NSF. The project aims to reduce noise in a headphone both in phase and amplitude.

University Service

Engineering Hall of Fame Committee

Recent Publications

H. C. Lin, "Nonvolatile Semiconductor Memory Technology," *IEEE Press*, pp. 89-155, 1998.

H. C. Lin, "Signal Processing Modifications Using Multiple-Valued Literal Gate Based on Resonant Tunneling Diodes," *IEEE Intl. Symp. on Circuits and Systems*, June 1997.

H. C. Lin, "Resonant Tunneling Diodes for Multi-Valued Digital Applications," University of Illinios, Chicago, Ill., Nov. 1997.

Patent Disclosures

H. C. Lin and Tang Hao, "Multiple-Valued Literal Circuit Using Resonant Tunneling Diodes," U.S. Patent

5,714,891, issued Feb. 3, 1998, to the University of Maryland.

K. J. Ray Liu

Associate Professor, Ph.D., University of California, Los Angeles.
NSF National Young Investigator; Joint Appointment with ISR.

Research Interests

Dr. Liu's research interests span all aspects of signal processing, including theory and analysis, parallel and distributed processing, fast algorithm, VLSI, and concurrent architecture, with application to image/video, communications, and medical and biomedical technology.

His current research activities include but are not limited to the three main areas described below.

In the area of VLSI signal processing, the effort is on the design and implementation of high-speed, low-power signal/image processing systems such as the development of low-complexity/real-time schemes for motion estimation and video coding/processing; and complex channel coding schemes.

In the area of image and video processing, the focus is on the development of low-complexity, low-bit rate video coding for robust transmission in wireless communications and networking.

In the area of wireless communications, we are working on the application of signal processing/array processing to wireless communications and networking.

Professional Service

Guest Ed., Special Issue on Signal Processing for Wireless Communications, *IEEE Journal of Selected Areas in Communications*; Series Ed. (Ed.-in-Chief); *The Marcel Dekker Book Series on Signal Processing*, Guest Ed., *Special Issue on Multimedia Signal Processing and Technology, Proceedings of the IEEE*, Ed., *Journal of VLSI Signal Processing*, Multimedia Signal Processing Technical Committee, IEEE Signal Processing Society; DSP/SSAP/UASP Transition Committee, IEEE Signal Processing Society; Publicity Chair, IEEE Intl. Workshop on Multimedia Signal Processing.

University Service

Electtrical Engineering: Faculty Recruiting Committee; Salary Committee; General Academic Affairs Committee.

Recent Publications

K. J. R. Liu and K. Yao, "High Performance VLSI Signal Processing: Volume I: System Design and Methodology," *IEEE Press*, 1998. (Published in Nov. 1997)

K. J. R. Liu and K. Yao, "High Performance VLSI Signal Processing: Vol II: Algorithms, Architectures, and Applications," *IEEE Press*, 1998. (Published in Nov. 1997)

F. Rashid-Farrokhi, K. J. R. Liu, and L. Tassiulas, "Downlink Power Control and Base Station Assignment," *IEEE Communications Lett.*, vol. 1, no. 4, pp.102-104, July 1997.

F. Rashid-Farrokhi, K. J. R. Liu, C. Bernstein, and D. Walnut, "Wavelet-Based Multiresolution Local Tomography," *IEEE Trans. on Image Processing*, vol. 6, no. 10, pp.1412-1430, Oct. 1997.

H. Li, K.J.R. Liu, and S.B. Lo, "Fractal Modeling and Segmentation for the Enhancement of Microcalcifications in Digital Mammograms," *IEEE Trans. Medical Imaging*, vol. 16, no. 6, pp. 785-798, Dec. 1997.

Y. Li, J. Razavilar, and K. J. R. Liu, "A High-Resolution Technique for Multi-Dimensional NMR Spectroscopy," *IEEE Trans. on Biomedical Engineering*, vol. 45, no. 1, pp.78-86, Jan. 1998.

A.Y. Wu, K. J. R. Liu, and A. Raghupathy, "System Architecture of An Adaptive Reconfigurable DSP Computing Engine," *IEEE Trans. on Circuits and Systems for Video Technology*, vol. 8, no. 1, pp.54-73, Feb. 1998.

F. Rashid-Farrokhi, K.J.R. Liu, and L. Tassiulas, "Transmit Beamforming for Cellular Wireless Communication Systems," *Proc. of 31th Annual Conf. on Info. Sci. and Systems*, vol. 1, pp. 92-97, March, 1997.

F. Rashid-Farrokhi and K.J.R. Liu, "Throughput Enhancement in Multiple Access Networks Using Antenna Arrays," *Proc. of 31th Annual Conf. on Info. Sci. and Systems*, vol. 1, pp. 678-683, March 1997.

Y. Li and K.J.R. Liu, "Blind Adaptive Equalization and Diversity Combining," *Proc. IEEE Intl. Conf. Acoustic, Speech, and Signal Processing (ICASSP)*, Munich, Germany, April 1997.

F. Rashid-Farrokhi, K.J.R. Liu, and L. Tassiulas, "Downlink and Uplink Capacity Enhancement in Power Controlled Cellular Systems," *Proc. IEEE Intl. Vehicular Technology Conf.*, pp. 647-651, Phoenix, May, 1997.

A. Raghupathy and K.J.R. Liu, "Low-Power/High-Speed Design of Reed Solomon Decoder," *Proc. IEEE Int. Symp. on Circuits and Systems (ISCAS)*, vol. 3, pp. 2060-2063, Hong Kong, June 1997.

J. Chen and K.J.R. Liu, "A Complete Pipelined Parallel CORDIC Architecture for Motion Estimation," *Proc. IEEE Intl. Symp. on Circuits and Systems (ISCAS)*, vol. 4, pp. 2801-2804, Hong Kong, June 1997.

P. Hsu, K. J. R. Liu, and T. Chen, "2-D Mesh Motion Compensation with Adaptive Interpolation," *Proc. First IEEE Intl. Workshop on Multimedia Signal Processing*, pp. 213-218, Princeton, June, 1997.

Y. Li and K. J. R. Liu, "Blind Identification and Equalization for Wireless Communications Using Antenna Arrays," (invited paper), *Proc. SPIE: Advanced Signal Processing*, pp.251-262, San Diego, July 1997.

J. Chen and K. J. R. Liu, "A Fully Pipelined Parallel CORDIC Architecture for Half-Pel Motion Estimation," *Proc. IEEE Intl. Conf. on Image Processing (ICIP)*, vol. 2, pp. 574-577, Santa Barbara, Calif., Oct 1997.

H. Li, K. J. R. Liu, S. B. Lo, and Y.

Wang, "Stochastic Model and Probabilistic Decision-Based Classifier for Mass Detection in Digital Mammography," *Proc. IEEE Intl. Conf. on Image Processing (ICIP)*, vol. 3, pp. 539-542, Santa Barbara, Calif., Oct 1997.

P. Hsu, K. J. R. Liu, and T. Chen, "An Adaptive Interpolation Scheme for 2-D Mesh Motion Compensation," *Proc. IEEE Intl. Conf. on Image Processing (ICIP)*, vol. 3, pp. 646-649, Santa Barbara, Calif., Oct 1997.

U. V. Koc and K. J. R. Liu, "DCT-Based Subpixel Motion Compensation and Fully DCT-Based Video Coder," *Proc. IEEE Intl. Conf. on Image Processing (ICIP)*, vol. 3, pp. 598-601, Santa Barbara, Calif., Oct 1997.

F. Rashid-Farrokhi, K.J.R. Liu, and L. Tassiulas, "Transmit and Receive Diversity and equalization in Wireless Networks with Fading Channels," *Proc. IEEE GLOBECOM*, pp. I-555-559, Phoenix, Ariz., Nov. 1997.

F. Rashid-Farrokhi, K.J.R. Liu, and L. Tassiulas, "Transmit Diversity and Equalization for Power Controlled Wireless Networks," *Proc. 31st Asilomar Conf. on Signals, Systems, and Computers*, Pacific Grove, Nov. 1997.

J. Razavilar and K. J. R. Liu, "Blocking Probability of Handoff Calls and Carried Traffic in Wireless Networks with Antenna Arrays," *Proc. 31st Asilomar Conf. on Signals, Systems, and Computers*, Pacific Grove, Nov. 1997.

Patent Disclosures

U. V. Koc and K. J. R. Liu, "Low-Complexity Motion Estimation Techniques," U.S. Patent no. 5,790,686, August 4, 1998.

Armand M. Makowski

Professor,
Ph.D., University of Kentucky.
NSF Presidential Young Investigator; Joint Appointment with ISR.

Research Interests

Dr. Makowski's research interests broadly lie in applying advanced methods from the theory of stochastic processes to the modeling and design of a variety of engineering systems. Particular emphasis has been given to issues of performance modeling and analysis, and to problems of dynamic stochastic optimization as they arise in hybrid terrestrial and satellite networking applications.

Recent research interests include the use of asymptotic methods for the performance evaluation of switching systems, long-range dependence modeling for multimedia applications in high-speed networks, and stochastic control formulation of resource allocation issues in wireless networks (e.g., handoffs and paging). He is also currently involved in several industry-sponsored projects dealing with ATM technology.

Professional Service

Assoc. Ed., Discrete Event Dynamic Systems–Theory & Applications.

Recent Publications

R. Rezaiifar and A. M. Makowski, "From Optical Search Theory to Efficient Mobility Management Strategies for Cellular Networks," *IEEE J. on Selected Areas in Communications*, vol. JSAC-15, pp.1253-1264, 1997.

M. Parulekar and A. M. Makowski, "M|GI|∞ Input Processes: A Versatile Class of Models for Traffic Network," *Proc. of Infocom '97*, pp. 1452-1459, Kobe, Japan, April 1997.

K. Tsoukatos and A. M. Makowski, "Heavy Traffic Analysis for a Multiplexer Driven by M|GI|∞ Input Processes," *Proc. 15th Intl. Teletraffic Congress*, pp. 497-506, Washington, D.C., June 1997.

Steven I. Marcus

Professor,
Ph.D., Massachusetts Institute of Technology.
IEEE Fellow; Joint Appointment with ISR.

Research Interests

Dr. Marcus' research interests are in the areas of control and systems engineering, analysis and control of stochastic systems, Markov decision processes, discrete event systems, and fault detection, with applications in manufacturing, acoustics, and communication networks.

His research spans both discrete and continuous time stochastic control problems. In discrete time, his research has focused on Hidden Markov Models, motivated by quality control problems arising in manufacturing and control problems in communication networks. In particular, he is conducting an extensive research program in the adaptive estimation and control of Hidden Markov Models. Current research focuses on problems with robust and risk-sensitive cost, and on the application of these adaptive methods to problems of reinforcement learning. In continuous time, motivated by flexible manufacturing applications, his research has been concerned with hybrid control problems (controlled switching diffusions) involving both continuous and discrete states.

He is working on a number of applications of these techniques. One current project involves communication network control with delayed or incomplete state information, robust network control, and learning and adaptive network control. Another current activity involves the application of adaptive control techniques to fault detection methodologies, with application to the detection of faults on the basis of acoustic data.

His current research includes a project which is developing new approaches to operational decision making in semi-

conductor manufacturing. Stochastic control and Markov decision process (MDP) models are being applied to the development of techniques that integrate product and market dynamics into operational decision making algorithms. In particular, MDP models being developed use aggregate fab models, and include life cycle dynamics such as technology shrink, modular implementation, and learning. Risk sensitive and adaptive MDP solution algorithms are being pursued.

Professional Service

Ed. Advisory Board, *Acta Applicandae Mathematicae*; Assoc. Ed., *Mathematics of Control, Signals, and Systems*; Assoc. Ed., *Discrete Event Dynamic Systems: Theory and Applications*; Corresponding Ed., *SIAM Journal on Control and Optimization*; Organizing Committee, 1998 SIAM Conf. on Control and its Applications.

University Service

Electrial Engineering: Chair, Faculty Recruiting Committee; Chair, Department Council; Graduate Studies and Research Committee; Chair, Ph.D. Panel. ISR Executive Committee.

Recent Publications

E. Fernandez-Gaucherand and S. I. Marcus, "Risk-Sensitive Optimal Control of Hidden Markov Models: Structural Results," *IEEE Trans. Automatic Control*, vol. 42, pp. 1418-1422, October 1997.

M. K. Ghosh, A. Arapostathis, and S. I. Marcus, "Ergodic Control of Switching Diffusions," *SIAM J. on Control and Optimization*, vol. 35, pp. 1952-1988, November 1997.

R. Kumar, S. Nelvagal and S. I. Marcus, "A Discrete Event Systems Approach for Protocol Conversion," *Discrete Event Dynamic Systems: Theory and Applications*, vol. 7, pp. 295-315, 1997.

M. K. Ghosh and S. I. Marcus, "Stochastic Differential Games with Multiple Modes," *Stochastic Analysis and Applications*, vol. 16, pp. 91-105, 1998.

A. Thomas and S.I. Marcus, "Reinforcement Learning in MDP Framework Using Temporal Differences," *Proc. 1997 Conf. on Information Sciences and Systems,* pp. 636-641, Johns Hopkins Univ., Baltimore, Md., March 1997.

S. Coraluppi and S. I. Marcus, "Mixed Risk-Neutral/Minimax Control of Markov Decision Processes," *Proc. 1997 Conf. on Information Sciences and Systems*, pp. 435-440, Johns Hopkins Univ., Baltimore, MD, March 1997.

S. Coraluppi and S. I. Marcus, "Observations on Nonlinear Risk-Sensitive Control," *Proc. 1997 Conf. on Information Sciences and Systems*, pp. 458-459, Johns Hopkins Univ., Baltimore, MD, March 1997.

S. Coraluppi and S. I. Marcus, "Risk-Sensitive Queueing," *Proc. 35th Annual Allerton Conf. on Communication, Control, and Computing*, Urbana, Il., September-October, 1997.

A. Thomas and S.I. Marcus, "Reinforcement Learning for MDPs Using Temporal Difference Schemes," *Proc. 36th IEEE Conf. on Decision and Control*, San Diego, Calif., December 1997.

Isaak D. Mayergoyz

Professor,
Ph.D., Institute of Cybernetics, Ukrainian Academy of Science, USSR.
IEEE Fellow; Research Fellow of GE, Research and Development Center.

Research Interests

Dr. Mayergoyz's research interests are in the general areas of magnetics, electromagnetics, semiconductor device modeling, and power engineering. His current research activities are heavily focused in the areas of mathematical models for hysteresis (with special emphasis on magnetic and superconducting hysteresis), magnetic force microscopy and its applications to magnetic recording and data retrieval from magnetic media, analysis of electromagnetic fields in media with hysteresis, and numerical techniques for the calculation of 3-D electromagnetic fields.

Another component of his research activity is numerical modeling of semiconductor devices by using drift-diffusion, hydrodynamic and Boltzmann-Poisson models as well as noise analysis in semiconductor devices from the semi-classical transport point of view.

Professional Service

Ed., *IEEE Trans. on Magnetics*; Ed., *Electromagnetism Series*, Academic Press; IEEE Magnetics Society Administrative Committee; IEEE Magnetics Society Publication Department; Coordinator, IEEE Magnetics Society Distinguished Lecturer Program; NSF Site Renewal Panel, NSF Data Storage Systems Center; 7th Joint Intl. MMM-INTERMAG Conf. Program Committee.

University Service

Electrical Engineering: Chair, Promotion and Tenure Committee; New Faculty Orientation Program. Distinguished Scholar-Teacher Selection Committee; Material Research Science and Engineering Center Advisory Board.

Recent Publications

I. D. Mayergoyz and M. Neely, "Nonlinear Diffusion in Anisotropic Superconductors," *J. of Applied Physics*, vol. 81, no. 8, pp. 4234-4236, 1997.

I. D. Mayergoyz, R. Madabhushi, E. R. Burke, R. D. Gomez, "Analytical Solution for the Side-Fringing Fields of Narrow Beveled Heads," *J. of Applied Physics*, vol. 81, no. 8, pp. 4850-4852, 1997.

C. E. Korman and I. D. Mayergoyz, "Review of Presiach Type Models Driven by Stochastic Inputs as Models for After-Effect," *Physica B (condensed matter)*, vol. 233, pp. 381-389, 1997.

A. A. Adly, I. D. Mayergoyz and A. Bergquist, "Utilizing Anisotropic Presiach-Type Models in the Accurate Simulation of Magnetorestriction," *IEEE Trans. on Magnetics*, vol. 33, no. 5, pp. 3931-3933, 1997.

R. Madabhushi, R. D. Gomez, E. R. Burke, I. D. Mayergoyz and J. Orloff, "Inter-Track Interference Studies Using

MFM Image Reconstruction," *IEEE Trans. on Magnetics*, vol. 33, no. 5, pp. 4053-4055, 1997.

A. A. Adly and I. D. Mayergoyz, "Accurate Modeling of Vector Hysteresis by Using Superpositions of Presiach-Type Models," *IEEE Trans. on Magnetics*, vol. 33, no. 5, pp. 4155-4157, 1997.

C.-H. Chang, C.-K. Lin, W. Liang, N. Goldsman, P. Oldiges and J. Melngailis, "The Spherical Harmonic Method: Corroboration with Monte Carlo and Experiment," *Proc. Intl. Conf. on Simulation of Semiconductor Processes and Devices (SISPAD)*, pp. 225-228, 1997.

C. Korman and I. D. Mayergoyz, "Semiconductor Noise in the Framework of Semiclassical Transport," *Proc. Intl. Symp. on Theoretical Electrical Engineering*, pp. 142-147, Palermo, Italy, June 1997.

John Melngailis

Professor,
Ph.D., Carnegie Melon University.
Joint Appointment with IPR.

Research Interests

The research work of Dr. John Melngailis is in the use of ion beams in microfabrication. This includes both focused (point) beams and ion image projection. Focused ion beams are used in the semiconductor industry for local circuit rewiring, for failure analysis, and for mask repair. These applications depend on ion beam induced deposition, ion milling, and gas assisted ion etching. Our efforts are aimed at improving and expanding the usefulness of these techniques by understanding the beam induced microchemistry operating at dimensions below 50 nm, and by developing new applications. A new effort is also launched on the application of higher energy focused ion beam systems to direct maskless, resistless implantation of semiconductor devices. This technique permits the properties of semiconductors to be altered by doping with less than 0.1 µm lateral resolution opening the door to new types of devices.

Ion image projection is a promising technique for future chip fabrication. At present, photolithography is still being used to define the patterns on semiconductor chips down to 0.25 µm minimum linewidth. As minimum dimensions shrink to 0.1 µm and below, a new kind of lithography will need to be developed. The work done here includes modelling of mask distortion due to stress relief, mask heating and cooling, and negative ion source development.

Professional Service

Co-Chair, U.S.-Japan Workshop on Focused Ion Beam Technology.

University Service

Electrical Engineering: Chair, Department Council; Faculty Search Committee; Undergraduate Affairs Committee. Ward Chair Search Committee.

Recent Publications

A. A. Mondelli, I. L. Berry, J. Melngailis and G. Gross, "Ion Projection Lithography," *Microlithography World*, vol. 12, autumn 1997.

C.-C. Shen, J. Murguia, N.Goldsman, M. Peckerar, J. Melngailis and D. A. Antoniadis, "Use of Focused-Ion-Beam and Modeling to Optimize Submicron MOSFET Characteristics," *IEEE Trans. on Electron Devices*, vol. 45, no. 2, Feb. 1998.

S. K. Guharay, E. A. Sokolovsky, M. Reiser, J. Orloff and J. Melngailis, "Study of Energy Broadening of High-brightness Ion Beams form a Surface Plasma Penning Source and its Relevance in Ion Projection Lithography," *Microelectronics Engineering*, vol. 35, p. 435, 1997.

L. Didenko, J. Melngailis, H. Loschner, G. Stengl, A. Chalupka and A. Shimkunas, "Analysis of Stencil Mask Distortion in Ion Projection Lithography," *Microelectronics Engineering*, vol. 35, p. 443, 1997.

E. Chason, S. T. Picraux, J. M. Poate, J. O. Borland, M. I. Current, T. Diaz de la Rubia, D. J. K. Eaglesham, O. W. Holland, M. E. Law, C. W. Magee, J. W. Mayer, J. Melngailis and A. F. Tasch, "Ion Beams in Silicon Processing and Characterization," *J. of Appl. Phys.*, vol. 81, no. 10, p. 6513, May 1997.

D. Santamore, K. Edinger, J. Orloff and J. Melngailis, "Focused Ion Beam Sputter Yield Change as Function of Scan Speed," *J. Vac. Sci. Tech.*, vol. 15, no. 6, p. 2346, Nov./Dec. 1997.

C.-H. Chen, Z. Trajanovic, Z. W. Dong, C. J. Lobb, T. Venkatesan, K. Edinger, J. Orloff and J. Melngailis, "Fabrication of High-Temperature Superconductor Josephson Junctions by Focused Ion Beam Milling," *J. Vac. Sci. Tech.*, vol. 15, no. 6, p. 2379, Nov./Dec. 1997.

I. L. Berry, A. A. Mondelli, J. Nichols and J. Melngailis, "Programmable Aperture Plate for Maskless High-Throughput Nanolithography," *J. Vac. Sci. Tech.,* vol. 15, no. 6, p. 2382, Nov./Dec. 1997.

W. Wang, C. Chang, D. Ma, M. Peckerar, I. Berry, N. Goldsman and J. Melngailis, "Self-aligned Subchannel Implant Complementary Metal-Oxide Semiconductor Devices Fabrication," *J. Vac. Sci. Tech.*, vol. 15, no. 6, p. 2816, Nov./Dec. 1997.

K. Edinger, V. Yun, J. Melngailis, J. Orloff and G. Magera, "Development of a High Brightness Gas Field Ion Source," *J. Vac. Sci. Tech.*, vol. 15, no. 6, p. 2365, Nov./Dec. 1997.

Howard M. Milchberg

Professor,
Ph.D., Princeton University.
NSF Presidential Young Investigator; American Physical Society Fellow;
Joint Appointment with IPST.

Research Interests

Professor Milchberg's research interests are in the area of laser-matter interactions. With use of state-of-the-art high power, ultrashort pulse lasers (which his group designs and builds), his activities

encompass the regimes of linear through strongly nonlinear nonperturbative optics. The research is highly interdisciplinary, including elements of solid state physics, atomic physics, plasma physics, and quantum electronics. Applications of these studies include efficient sources of coherent X-rays (extreme harmonics or X-ray lasers) for use in imaging or patterning applications and compact table-top GeV electron accelerators. Among recent results which will bring such applications closer to reality was the first ever demonstration by his group of the optical guiding of ultrahigh intensity laser pulses.

Professional Service

OSA Conference on Applications of High Field and Short Wavelength Sources VIII Program Committee; Invited Workshop Discussion Leader, Berkeley Workshop on Fast Ignitor Physics; CLEO/QELS Meeting Program Committee; APS Division of Plasma Physics meeting Program Committee.

University Service

IPST: Policy, Facilities and Services Committee.

Recent Publications

T. R. Clark and H. M. Milchberg, "Space and Time Resolved Evolution of the Plasma Waveguide," *Phys. Rev. Lett.*, vol. 78, p. 2373, 1997.

S. P. Nikitin, T. Antonsen, T. R. Clark, Y. Li, and H. M. Milchberg, "Guiding of Intense Femtosecond Pulses in Preformed Plasma Channels," *Opt. Lett.,* vol. 22, p. 1787, 1997.

T. R. Clark and H. M. Milchberg, "Laser-Driven Implosion of Cylindrical Plasma," *Phys. Rev.*, E 57, p. 3417, 1998.

T. R. Clark and H. M. Milchberg, "Space and Time-Resolved Measurement of the Evolution of the Plasma Waveguide," *Prof. Conf. on High Field Interactions and Short Wavelength Generation*, Sante Fe, NM.

Linda Milor

Assistant Professor, Ph.D., University of California, Berkeley. NSF Career Award; Joint Appointment with ISR.

Research Interests

Dr. Milor's research interest is in the testing of analog and mixed signal circuits. Because analog and mixed signal testing accounts for a significant portion of final device cost, it is considered one of the most important problems in integrated circuit design by many large companies and the Semiconductor Industry Association. In her work, the use of semiconductor process characterization data and circuit/behavioral simulation has been proposed to reduce the cost of production testing of analog circuits. Algorithms have been developed for optimally ordering tests and for identifying redundant tests, which can be dropped without significant fault coverage loss.

A circuit, in order to be manufacturable, needs to be insensitive to uncontrollable variations in the manufacturing process. In her work, statistical modeling algorithms have been developed for calculating parametric yield. Statistical modeling reduces the computational cost of yield estimation by replacing Monte Carlo simulations with a response surface model. Her work primarily concentrates on constructing nonlinear response surface models for high dimensional functions.

Kazuo Nakajima

Professor, Ph.D., Northwestern University. NSF Presidential Young Investigator.

Research Interests

Dr. Nakajima's research interests are in the general area of computer software/hardware codesign, VLSI, large-scale computational methods, parallel/distributed computing systems, fault-tolerant computing, and applied graph theory. His current research activities include software/hardware codesign, VLSI system design, VLSI design automation, and large-scale computational methods.

The recent advancements of VLSI CAD tools and reconfigurable VLSI devices have made it possible to develop both software and hardware for application- and algorithm-specific computing systems. Using state-of-the-art CAD tools, including Hardware Description Languages, application-specific RISC processors and DSP chips are designed and fabricated into VLSI chips. Low-power chip design methodologies, in particular, at the algorithmic and architectural levels, are also investigated. Based on a recently established algorithm/architecture-based low-power design methodology, 11,500-gate CMOS DSP chips were designed, fabricated, and successfully tested in the VLSI Design Automation Lab (in collaboration with Dr. Liu). These chips are also of high performance when regular supply voltages are applied.

In the area of VLSI design automation, efficient algorithms are developed for routing and placement for gate arrays, FPGAs, and MCMs. Some of our algorithms have been implemented in CAD tools in Japan, having produced more than 500 commercial chips. Development of neural network-based algorithms and integrated design system for algorithm-based low-power DSP chips are also in progress.

In the areas of large-scale computational methods and their parallel computing system design, a new method of solving linear equations has been established. It has been applied in many fields, and various improvements over the traditional methods have been reported, such as speed-up of the SPICE circuit simulator. Parallel and distributed system architectures for hardware implementation of this method are also investigated. The ultimate goal is to build application/

algorithm-specific computing hardware systems.

Professional Service

Assoc. Ed., *Journal of Circuits, Systems, and Computers.*

University Services

Electrical Engineering: Chair, General Academic Affairs Committee; Faculty Search Committee; Ad Hoc Committee on the Review of Graduation Requirements for the M.S. and Ph.D. Degrees in Electrical Engineering; Graduate Studies and Research Committee; Chair, Facilities and Services Committee; MOSIS Subcommittee.

Recent Publications

J. Narasimhan, K. Nakajima and C. S. Rim, "A Graph Theoretical Approach for the Yield Enhancement of Reconfigurable VLSI/WSI Arrays," *Discrete Applied Mathematics.*

Y.-J. Cha, C. S. Rim and K. Nakajima, "SEGRA: A Very Fast General Area Router for Multichip Modules," *IEEE Trans. on Computer-Aided Design of Integrated Circuits and Systems.*

Prakash Narayan

Professor,
D.Sc., Washington University, St. Louis.
Joint Appointment with ISR.

Research Interests

Dr. Narayan's research interests are in the areas of information and communication theory, performance evaluation issues in hybrid wideband terrestrial and satellite communication networks, and system modeling and identification. Applications include data and video compression, transmitter-receiver designs for communication systems, speech recognition, and switching and capacity assignment in high-speed networks.

His current research activities include the statistical modeling of data and universal data compression. This work, which is at the interface of information theory and statistics, involves an investigation of general models for "real" data and the associated theoretical limits of compressibility, together with the development of finite-state algorithms for compressing the data efficiently and on-line. A related activity concerns a study of the fundamental limits of, as well as efficient schemes for, hierarchical or multi-resolution data/video compression and routing in multicasting applications. The issues of bit allocation and rate control for video compression are also being addressed.

Another activity focuses on design and performance analysis for high-speed terrestrial and satellite networks. This study includes the development of models for multimedia traffic displaying short- and long-range dependencies, and the evaluation of component performance and end-to-end quality of service with applications to buffer engineering and capacity assignment. Fundamental limits of transmission over (time-varying) wireless channels, as well as security issues, are also being addressed.

University Service

President's Commission on Ethnic and Minority Issues; Chair, Department of Electrical Engineering Post-Tenure Faculty Review Committee. ISR: Salary Committee; Post-Doctoral Fellow Committee.

Recent Publications

I. Csiszár and P. Narayan, "Common Randomness and Secret Key Generation with a Helper," *Proc. IEEE Intl. Symp. on Information Theory*, p. 157, Ulm, Germany, June-July 1997.

A. Das and P. Narayan, "Transmission Capacity Assignment to Two Service Classes with Different Priorities," *Proc. 2nd Annual Fedlab Symp. (ATIRP Conf.)*, pp.102-106, College Park, Md., February 1998.

Robert W. Newcomb

Professor,
Ph.D., University of California, Berkeley.
IEEE Life Fellow.
Registered Professional Engineer.

Research Interests

Professor Newcomb's research interests are in the general area of circuit and systems theory with reference to VLSI realizations, especially for neural networks, analog circuit syntesis, and biomedically related systems.

Much of his current research is oriented toward analog circuits and biologically realistic neural networks, including those with live neurons on silicon chips. Some of this research stems from joint undertakings with colleagues at other institutions. For example, the neurophysiologically oriented neural network PC program SYNETSIM of Dr. D. Hartline at the University of Hawaii has been made user friendly by his research group, and is presently being translated from a software to a hardware version. Related research concerns the generation of chaos in biologically realistic artificial neural networks, with the intent of being able to develop means to control chaotic activity, such as epilepsy and heart attacks, in biological systems. On the more mathematical side, a functional neural network has been developed which is based upon reproducing kernels in Hilbert space and which can be used to model dynamical systems for nonlinear control, this work being also carried out in conjunction with colleagues at the University of California, Irvine. Applications of developed circuits are made to multiple armed robots and new classes of computers including his soliton computer.

One of the primary research efforts of his Micro-Systems Laboratory group is associated with self emissions from the ear. Theories for these emissions are under development, as well as circuits which can be used to control them and which also lead to new classes of

hearing aids and sound detection and processing systems.

Professional Service

Assoc. Ed.: *IEEE Trans. on Circuits and Systems*; *Circuits, Systems, and Signal Processing*; *Neurocomputing*. IJCNN Program Committee; ICARCV '98 Intl. Advisory Committee; CSC'98 Intl. Scientific Committee; Compu Panel Member, Computer World national survey member; Singapore Trade Development Board Survey Member; VLSI Neural Networks for Intelligent Signal Processing, ISCAS Organizer; Chair and Organizer, Neural Networks Hardware, MWCAS; Chair, System and Implementation I, ICICS; Chair, Novel Computational Cybernetic Concepts and Applications, SMC; Neural Networks Session Organizer, ICARCV 1998, Paintbranch High School student research supervisor.

University Service

Visiting Scholar Supervisor; Founder, AAP University Poetry Prize.

Recent Publications

L. Sellami and R. W. Newcomb, "A Digital Scattering Model of the Cochlea," *IEEE Trans. on Circuits and Systems–I, Fundamental Theory and Applications*, vol. 44, no. 2, pp. 174-180, February 1997.

L. Sellami and R. W. Newcomb, "Computable Real Lattice Structures for Cochlea-Like Digital Filters," *CSSP Journal*, vol. 17, no. 1, pp. 103-116, 1998.

S. K. Singh, D. A. Panagiotopoulos, T. R. Darden and R. W. Newcomb, "Hardware Oriented Semistate Descriptions of Functional Artificial Neural Networks," *SMC'97 Conf. Proc.*, pp. 13-18, Orlando, Fla., October 1997.

D. A. Panagiotopoulos, S. K. Singh and R. W. Newcomb, "VLSI Implementation of a Functional Neural Network," *Proc. ISCAS'97*, pp. 701-704, Hong Kong, June 1997.

L. Sellami and R. W. Newcomb, "A Pipelined Synthesis of Cochlea DSp Lattice Filters," *Proc. 1st Intl. Conf. on Information, Communications & Signal Processing*, pp. 1163-1167, Singapore, Sept. 1997.

S. K. Singh, D. A. Panagiotopoulos, T. R. Darden and R. W. Newcomb, "Hardware-Oriented Semistate Descriptions of Functional Artificial Neural Networks," *Proc. 1997 IEEE Intl. Conf. on Systems, Man, and Cybernetics*, pp. 13-18, Orlando, Fla., October 1997.

L. Sellami, S. K. Singh, R. W. Newcomb and G. Moon, "Linear Bilateral CMOS Resistor for Neural-Type Circuits," *Proc. 40th Midwest Symp. on Circuits and Systems*, pp. 1330-1333, Sacramento, CA, August 1997.

Jon Orloff

Professor,
Ph.D., Oregon Graduate Center.
NSF Presidential Young Investigator; Joint Appointment with IPR.

Research Interests

Dr. Orloff's interests are in the production, focusing, and applications of high brightness ion and electron beams. His research is in field emission ion sources, ion optics, and applications of high resolution focused ion beams.

Dr. Orloff joined the faculty at the University of Maryland in December 1993. In 1994, he was principally involved in the establishment of the Laboratory for Ion Beam Research and Applications. His present work involves studies of high brightness gas phase field ionization sources for possible applications in ion lithography and high resolution ion microscopy. Dr. Orloff is also doing research on novel lenses, including space charge lenses, that can be used to improve the performance of the sort of high resolution focused ion beam systems that are widely used for semiconductor device design and fabrication. With the installation at Maryland in the summer of 1995 of a high performance focused ion beam/scanning electron microscope system, he began research in the area of micromachining–the direct fabrication of objects at scale of ~10 micrometers. He is also planning work on the study of new classes of electrohydro-dynamic ion sources for possible application in secondary ion mass spectrometry, as well as beam induced chemistry.

Professional Service

EIPBN Symposium Advisory Committee.

University Service

Electrical Engineering: General Affairs Academic Committee; Post-Tenure Review Committee. Senate Core Committee; Senate.

Recent Publications

J. Orloff, Ed., "Handbook of Charged Particle Optics," CRC Press, Boca Raton, La., 1997.

C.-H. Chen, Z. Trajanovic, Z. W. Dong, C. J. Lobb, T. Venkatesan, K. Edinger, J. Orloff and J. Melngailis, "Fabrication of High Temperature Superconductor Josephson Junctions by Focused Ion Beam Milling," *J. Vac. Sci. Tech.*, vol. B15, p. 2379, 1997.

D. Sanatmore, K. Edinger, J. Orloff and J. Melngailis, "Focused Ion Beam Sputter Yield Changes as a Function of Scan Speed," *J. Vac. Sci. Tech.*, vol. B15, p.2346, 1997.

K. Edinger, V. Yun, J. Melngailis, J. Orloff and G. Magera, "Development of a High Brightness Gas Field Ion Source," *J. Vac. Sci. Tech.*, vol. B15, p. 2365, 1997.

L. C. Chao, J. Orloff and L. Wang, "Spherical Aberration Corrector Using Space Charge," *J. Vac. Sci. Tech.,* vol. B15, p. 2732, 1997.

A. Yavuz Oruç

Professor,
Ph.D., Syracuse University.

Research Interests

Dr. Oruç's research is motivated by a variety of problems which arise in the analysis and design of networks for advanced computer and communication systems. These problems range from lower bound complexity questions for

certain types of interconnection structures, such as concentrators, superconcentrators, permuters, generalizers, sorters, and nonblocking networks, to the proofs of their existence as well as their explicit constructions within asymptotical orders of such lower bounds. Our techniques in attacking these problems rely on both deterministic and random computation and communication models. Our more recent work on networks has focused on packet switching and buffered network models, and the complexity of packet switching networks.

Professor Oruç is also interested in nurturing synergies between different areas of research on computer and communication systems. In this regard, his recent research concentrated on how to use cyclic permutation networks to compute various scalar and vector computations by exploiting monoid and group isomorphisms between algebraic and permutation groups. This work resulted in a U.S. patent. The structure of full linear groups of nonsingular matrices to develop a network-based computer for matrix computations is presently being studied.

More recently, Professor Oruç has been working on developing educational tools for teaching computer architecture. In particular, he designed and developed a graphics-oriented computer simulator, called CodeMill, with Dr. Emre Gündüzhan. CodeMill is a first generation multimedia architecture, and Dr. Oruç is currently working to expand its capabilities to simulate a wider range of computer architectures.

University Service

Department of Electrical Engineering Ph.D. Exam Panel.

Recent Publications

M. B. Lin and A. Y. Oruç, "Design of an Optoelectronic Arithmetic Processor Based on Permutation Networks," *IEEE Trans. on Comput.*, January 1997.

E. Gündüzhan and A. Y. Oruç, "Structure and Density of Sparse Crossbar Concentrators," *DIMACS Workshop on Nonblocking Switched Networks*, invited paper, Princeton, NJ, July 1997.

Edward Ott

Professor, Ph.D., Polytechnic Institute of Brooklyn. Distinguished University Professor; IEEE Fellow; American Physical Society Fellow; Joint Appointments with Physics and ISR.

Research Interests

Professor Ott's research interests are in chaotic dynamics, fundamental theory of chaotic systems and their application to problems in science and engineering.

Some of his areas of interest where fundamental aspects of chaos have been investigated include: (1) bifurcations of chaotic attractors resulting in sudden changes in the size or character of the attractor; (2) studies of the properties of regions of state space that lead to different solutions (e.g., fractal basin boundaries); (3) the properties of chaotic transients (orbits that display chaotic behavior for a finite time after which they abruptly move off to execute some other type of motion); and (4) studies of the fractal and multifractal properties of invariant measures on chaotic attractors and other invariant chaotic sets.

Some of his areas of current interest where chaos theory is applied to problems in science and engineering are the following: (1) control of chaotic dynamical systems (the exponential sensitivity of chaos to small perturbations implies that chaotic systems can be controlled by use of only small controls); (2) use of the symbolic dynamics representation of chaotic orbits for the purposes of communication; and (3) application of chaotic dynamics to studies of fluids and plasmas (e.g., the kinematic dynamo problem which addresses the question of why the earth and the sun have magnetic fields).

Professional Service

IEEE Nuclear and Plasma Science Society Human Rights Committee; Editorial Boards: *Chaos*; *Dynamics and Stability of Systems*. Chair, Selection Committee for the Dannie Heineman Prize for Mathematical Physics.

University Service

Electrical Engineeirng: Department Council; Ward Chair, Search Committee; Chair, Qualifying Exam Committee. Physics: Chair, Department Council; APT Committee; Asst. Prof. Faculty Search Committee; Physics Colloquium Organizer.

Recent Publications

E. Ott, U. Feudel and C. Grebogi, "Phase Locking in Quasiperiodically Forced Systems," *Phys. Rpts.*, vol. 290, p. 11, 1997.

T. Bohr, G. Huber, and E. Ott, "The Structure of Spiral-Domain Patterns and Shocks in the 2D Complex Ginzburg-Landau Equation," *Physica*, vol. D 106, pp. 95-112 1997.

E. Ott, M. A. F. Sanjuan, J. Kennedy, and J. A. Yorke, "Indecomposable Continua and the Characterization of Strange Sets in Nonlinear Dynamics," *Phys. Rev. Lett.*, vol. 78, p. 1892, 1997.

E. Ott and B. R. Hunt, "Structure in the Parameter Dependence of Order and Chaos for the Quadratic Map," *J. Phys.*, vol. A30, p. 7067, 1997.

E. Ott, B. R. Hunt and J. A. Yorke, "Differential Generalized Synchronism," *Phys. Rev.*, vol. E55, p. 4029, 1997.

E. Ott, J. Jacobs and C. Grebogi, "Computing the Masure of Nonattracting Chaotic Sets," *Physica*, vol. D108, p. 1, 1997.

E. Ott, E. J. Kostelich, I. Kan, C. Grebogi and J. A. Yorke, "Unstable Dimension Variability: A Source of Nonhyperbolicity in Chaotic Systems," *Physica*, vol. D109, p. 81, 1997.

E. Ot and C. Schroer, "Targeting in Hamiltonian Systems with Mixed KAM/Chaotic Phase Spaces," *Chaos*, vol. 7, p. 512, 1997.

E. Ott, C. Reyl and T. M. Antonsen, "Nature of the Vorticity Field Generated by Instabilities of Chaotic Fluid Flows," *Phys. Rev. Lett.*, vol. 78, p. 2559, 1997.

E. Ott, J. Jacobs and B. R. Hunt, "Scaling of the Duration of Chaotic

Transients in Windows of Attracting Periodicity," *Phys. Rev.*, vol. E56, p. 6508, 1997.

E. Ott, J. Jacobs, T. M. Antonsen and J. A. Yorke, "Modeling Fractal Entrainment Sets of Tracers Advected by Chaotic Temporally Irregular Fluid Flows," *Physica*, vol. D110, p. 1, 1997.

E. Ott and P. So et al., "Extracting Unstable Periodic Orbits from Chaotic Time Series," *Phys. Rev.*, vol. E55, p. 5398, 1997.

E. Ott, S. C. Venkataramani and T. M. Antonsen, "Levy Flights in Fluid Flows with no KAm Surfaces," *Phys. Rev. Lett.*, vol. 78, p. 3864, 1997.

E. Ott, M. Gabbay and P. N. Guzdar, "Motion of Scroll Wave Filaments in the Complex Ginzburg-Landau Equation," *Phys. Rev. Lett.*, vol. 78, p. 2012, 1997.

E. Ott, T. M. Antonsen and J. Jacobs, "Fractal Patterms of Tracers Advected by Smotth Temporally Irregular Fluid Flows and Their Analysis by Use of Random Maps," *Fractals*, vol. 5, p. 119, 1997.

Adrian Papamarcou

Associate Professor and Associate Chair for Undergraduate Studies, Ph.D., Cornell University.

Research Interests

Dr. Papamarcou's research interests are in the areas of information theory and statistical communications. His current efforts are focused on the optimization of multi-sensor networks for distributed inference and data fusion. Different network configurations involving data collection and processing nodes connected via information links of varying capacity are considered. Algorithms are sought that optimally classify random signals while meeting constraints on complexity, time delay, and communication bandwidth. His approach, which is based on large-sample performance figures for regularized signal sources, yields powerful and insightful tools for optimal distributed inference. The results of his work also underscore fundamental differences in the choice of statistical methods and algorithms between single-sensor and multi-sensor systems.

University Service

Electrical Engineering: Associate Chair for Undergraduate Studies; General Academic Affairs Program Committee; Undergraduate Affairs Committee; Chair, Search Committee for Undergraduate Coordinator; Graduate Coordinator Search Committee. Dean's Selection Committee for Teaching Awards.

Martin Peckerar

Professor (Part-time), Ph.D., University of Maryland.
Fellow IEEE.

Research Interests

Dr. Peckerar received a B.S. degree from Stony Brook University, and his M.S. and Ph.D. degrees from the University of Maryland. In 1976, he joined the Westinghouse Advanced Technology Laboratory, where he led a group working in advanced MOS process development. At Westinghouse, he developed the deep-depletion CCD for x-ray and for IR imaging. In 1981, he became head of the Nanoelectronics Processing Facility at the Naval Research Laboratory (NRL) and, subsequently, head of the Surface and Interface Sciences Branch. There, he developed devices for deep-UV imaging, and was co-inventor of the laser-plasma source for x-ray lithography. He has: studied the effects of soft x-ray lithography on MOS devices; developed e-beam proximity correction techniques; and he was co-inventor of mono-molecular surface imaging resist currently under development between Shipley Corp. and NRL.

Dr. Peckerar has been a part-time professor in the department since 1983. He is co-author of the textbook *Electronic Materials: Science and Technology*, and editor of the book *Synthetic Microstructures in Biological Research*. He is currently head of the Surface and Interface Sciences Branch at NRL. Dr. Peckerar was elected Fellow of the IEEE in 1993.

Professional Service

Chief Technical Officer, DARPA Advanced Lithography Frequency; Rensselaer Polytechnic Institute Board of Directors.

Recent Publications

M. C. Peckerar, F. K. Perkins, E. A. Dobisz and O. J. Glemback, "Issues in Nanolithography for Quantum Effect Device Manufacture," *Handbook of Microlithohraphy, Micro Machining, and Microfabrication*, SPIE Press, Bellengham, WA, P. Rai-Chaudry, ed., 1997.

C.-C. Shen, J. Murguia, N. Goldsman, M. Peckerar, J. Melngailis and D. Antoniadis, "Use of Focused-Ion-Beam and Modeling to Optimize Submicron MOSFET Characteristics," *IEEE Trans. on Elec. Dev.*, vol. 45, no. 2, pp. 453-459, 1998.

F. K. Perkins, C. R. K. Marrian and M. C. Peckerar, "Novel Technique for Improving Pattern Placement in Membrane Mask Making," *J. Vac. Sci. Tech.*, vol. B15, no. 6, pp. 2218-2223, Nov.-Dec. 1997.

W. Wang, C. Chang, D. Ma, et al., "Self-Aligned Subchannel Implant Complementary Metal-Oxide Semiconductor Device Fabrication," J. Vac. Sci. Tech., vol. B15, no. 6, pp. 2816-2820, Nov.-Dec. 1997.

M. C. Peckerar, "The Evolution of GaN as an Electronic Material," *Proc. March Electrochemical Society Symposium on Components Semiconductors Materials, Characterizations, and Devices*, March 1997.

Martin P. Reiser

Professor,
Ph.D., Mainz University, Germany.
IEEE Fellow;
American Physical Society Fellow.

Research Interests

Dr. Reiser's research interests are in the general area of charged particle beams, in particular the study of fundamental properties of beams and the design of particle accelerators and other devices.

His current research activities are focused on experimental and theoretical investigations of beams with strong space-charge forces and applications, such as high-intensity accelerators (for science, material research, and energy), high-power microwave generators, and free-electron lasers. This work includes the self-consistent modeling of beams, the evolution of beam degradation, known as "emittance growth" due to mismatch, temperature anisotropy, instabilities, and other effects. Dr. Reiser is also interested in ion beam lithography.

The major results of this research over the past two decades have been covered in the book *Theory and Design of Charged Particle Beams*, which was published in the fall of 1994 by Wiley and Sons.

A new major research project, the Electron Ring facility, is currently under construction in the Institute for Plasma Research. It represents a unique research tool to study the physics of intense beams in recirculators, rings, and bending systems for advanced accelerator applications. The Electron Ring serves as a small-scale, low-cost model to study the beam behavior in much larger and more expensive ion acclerators (e.g. the new Spallation Neutron Source for material science research in the federal budget for design and construction over the next few years). It provides a testbed for checking advanced computer codes with experiments and offers excellent opportunities for graduate studies in an exciting field of science and technology.

Professional Service

1997 Intl. Symposium on Heavy Ion Inertial Fusion Organizing Committee; 1999 Particle Accelerator Conf. Organizing and Program Committees.

Recent Publications

C. Allen and M. Reiser, "Optimal Transport of Particle Beams," *Nuclear Intrum. and Methods in Phys. Research*, vol. A 384, pp. 322-332, 1997.

S. K. Guharay, E. A. Soklovsky, M. Reiser, J. Orloff, J. Melngailis, Study of Energy Broadening of High-Brightness Ion Beams from a Surface Plasma Penning Source and its Relevance in Ion Beam Projection Lithography," *Microelectronics Eng.*, vol. 35, pp.435-438, 1997.

C. Allen, M. Reiser, "Bunched Beam Envelope Equations Including Image Effects from a Cylindrical Pipe," *Phys. Rev.*, vol. E55, pp. 7591-7605, 1997.

J. G. Wang, H. Suk, M. Reiser, "Experimental Investigtaion of the Resistive-Wall Instability for Localized Perturbations in the Long-Wavelength Range," *Phys. Rev. Lett.*, vol. 79, pp. 1042-1045, 1997.

M. Venturini and M. Reiser, "Self-Consistent Beam Distributions with Space Charge and Dispersion in a Circular Ring Lattice," *Phys. Rev. E*, vol. 57, 4725-4732, 1998.

S. Bernal, P. Chin, R. A. Kishek, Y. Li, M. Reiser, J. G. Wang, T. Godlove, I. Haber, "Transport of a Space-Charge Dominated Electron Beam in a Short-quadrupole Channel," *Phys. Rev. Special Topics–Accelerators and Beams*, Vol. 1, pp. 1-6, 1998.

M. Venturini and M. Reiser, "Self-consistent Beam Distributions with Space Charge and Dispersion in a Circular Ring Lattice," *Phys. Rev. E*, Vol. 57, pp. 4725-4732, 1998.

J. G. Wang and M. Reiser, "Longitudinal Space-Charge Waves and Instabilities in Intense Beams," *Physics of Plasmas*, Vol. 5, pp. 2064-2070, 1998.

M. Venturini and M. Reiser, "rms Envelope Equations in the Presence of Space Charge and Dispersion," *Phys. Rev. Lett.*, Vol. 81, pp. 96-99, 1998.

M. Reiser, "The Physics of High-Intensity Nonneutral Beams," *Workshop on Nonneutral Plasmas*, Univ. of Boulder, Color., July-August, 1997.

M. Reiser, "Beam Physics Issues in Heavy Ion Intertial Fusion Drivers," *Intl. Symp. on Heavy Ion Intertial Fusion*, Heidelberg, Germany, September 1997.

Moon-Jhong Rhee

Professor,
Ph.D., The Catholic University of America.

Research Interests

Dr. Rhee's research interests cover the broad area of charged particle beams, beam qualities, pulsed power systems, plasma focus, and pseudospark discharge.

His current research activities are centered around studies on pseudospark discharge. The pseudospark is a fast low-pressure gas discharge between a hollow cathode and a planar anode. Interesting phenomna associated with the discharge include fast spark-like discharge and charged particle emission during the discharge. Such phenomena would find immediate applications in fast switches, high-quality charged particle beam sources, and beam source for material processing. Systematic experimental studies have been carried out for the breakdown voltage characteristic, the electron beam current scaling, energy spectrum of the electron beam, the emittance and brightness of the electron beam, and the post acceleration of the electron beam. Interesting experimental results obtained are expressed in empirical formula that would be useful in understanding further the pseudospark phenomena. Currently, study of modeling the pseudospark breakdown is underway based on the measured breakdown voltage characteristic that distinctively differs from Paschen's law.

University Service
Electrical Engineering: Facilities Committee; Coordinator for WWW.

Azriel Rosenfeld

Affiliate Professor, Ph.D. (Math), Columbia University. IEEE Fellow; ACM Fellow; Joint Appointments with the deparments of Computer Science, Psychology, and Engineering.

Research Interests
Prof. Rosenfeld's research deals with many aspects of image analysis and computer vision, as well as geometry, robotics, media, and other topics.

Much of his research is on computer vision, or enabling computers "to see," by recognizing and analyzing images.

Dr. Rosenfeld's research in digital calculus involves the development of a "digital" function theory which treats "continuous" functions, "derivatives," and "integrals" of functions on digital spaces and establishes several of their basic properties. He has also studied "digital" complex functions, which are functions from two-dimensional (2D) space into a 2D space.

In addition, Dr. Rosenfeld is studying an important problem in computer vision: the decomposition of a shape into parts. He has developed a low precision discrete method, based on the 8-connected chain codes of the boundary and coboundary of the shape, that qualitativeley approximates PDE-based methods and avoids the singularity problem. He has also experimented with other (nonlinear) types of boundary evolution processes.

Dr. Rosenfeld's recent research includes digital geometry, robotic navigation, range distributions, recognition of roads in aerial images, video segmentation and compression, Intelligent Document Image Retrieval (IDIR), document compression, and document functionality.

Professional service:
Co-ed., *Machine Intelligence and Pattern Recognition*, Elsevier; *Imaging Science and Engineering, SPIE* Advisory Board; Ed. Board: *Information Sciences; Pattern Recognition Letters; Pattern Recognition; Computer Vision and Image Understanding; Image and Vision Computing; J. of Parallel and Distributed Computing; Intl. J. of Robotics and Computer-Integrated Manufacturing; Spatial Vision; Intl. J. of Intelligent Systems; Intl. J. of Computer Vision; J. of Visual Communication and Image Representation; IEICE (Japan) Transactions on Information and Systems; J. of Mathematical Imaging and Vision; Intl. J. of Pattern Recognition and Artificial Intelligence; Intl. J. of Expert Systems; Applied Intelligence; J. of Systems Integration; Pattern Recognition and Image Analysis; Intl. J. of Imaging Science and Technology; Real-Time Imaging; Intl. J. of Document Analysis and Recognition.* IEEE Computer Dictionary Project; IEEE Computer Society Awards Committee; IEEE Computer Society Golden Core Member.

University Service:
Director, Center for Automation Research; Steering Committee, Neurosciences Program.

Recent Publications

R. Klette, A. Rosenfeld and F. Sloboda, eds., "Advances in Digital and Computational Geometry," Springer, Singapore, 1998.

R. Klette, A. Rosenfeld, and F. Sloboda, eds., "Digital Geometry–Introduction and Bibliography," *Advances in Digital and Computational Geometry*, Springer, Singapore, pp. 1-54, 1998.

D. M. Mount and A. Rosenfeld, "Computational Geometry–A Subject-Classified Bibliography of Recent Research," ibid., pp. 341--363.

D. Doermann, J. Sauvola, H. Kauniskangas, C. Shin, M. Pietikainen, and A.Rosenfeld, "The Development of a General Framework for Intelligent Document Image Retrieval," in *Document Analysis Systems II*, J. I. Hall and S. L. Taylor, eds., World Scientific, Singapore, pp. 433-460, 1998.

R. S. Michalski, A. Rosenfeld, Z. Duric, M. Maloof and Q. Zheng, "Learning Patterns in Images," in *Machine Learning and Data Mining–Methods and Applications*, R. S. Michalski, I. Bratko, and M. Kubat, eds., Wiley, Chichester, England, pp. 241-268, 1998.

N. Netanyahu, V. Philomin, A.Rosenfeld and A. Stromberg, "Robust Detection of Straight and Circular Road Segments in Noisy Aerial Images," *Pattern Recognition*, vol. 30, pp. 1673-1686, 1997.

A. Rosenfeld and A. Nakamura, "Local Deformations of Digital Curves," *Pattern Recognition Lett.*, vol. 18, pp. 613-620, 1997.

A. Rosenfeld, "Illustrating Halakhah," *BDD*, vol. 6, pp. 17-26, 1998.

A. Rosenfeld, "Image Analysis and Computer Vision: 1997," *Computer Vision Image Understanding*, vol. pp. 239-284, 1998.

O. E. Kia, D. S. Doermann, A. Rosenfeld and R. Chellappa, "Symbolic Compression and Processing of Document Images," *Computer Vision Image Understanding*, vol. 70, pp. 335-349, 1998.

A.Rosenfeld, T. Y. Kong, and A. Nakamura, "Topology-Preserving Deformations of Two-Valued Digital Pictures," *Graphical Models Image Processing*, vol. 60, pp. 24-34, 1998.

S. Khuller, E. Rivlin, and A. Rosenfeld, "Graphbots: Cooperative Motion Planning in Discrete Spaces," *IEEE Trans. SMC*, vol. 28C, pp. 2938, 1998.

Z. Duric, E. Rivlin, and A. Rosenfeld, "Understanding Object Motion," *Image and Vision Computing*, vol. 16, pp. 785-797, 1998.

D. Doermann, E. Rivlin, and A. Rosenfeld, "The Function of Documents," *Image and Vision Computing*, vol. 16, pp. 799-814, 1998.

A. Y. Wu and A. Rosenfeld, "Geodesic Visibility in Graphs," *Information Sciences*, vol. 108, pp. 5-12, 1998.

A. Rosenfeld. and C. Y. Sher, "Detecting Image Primitives Using Feature Pyramids," *Information Sciences*, vol. 107, pp. 127-147, 1998.

A. Rosenfeld, "Fuzzy Geometry: An Updated Overview," *Information Sciences*, vol. 110, pp. 127-133, 1998.

S. Fejes and A. Rosenfeld, "Migration Processes 1: The Continuous Case," *J. Mathematical Imaging Vision*, vol. 8, pp. 5-25, 1998.

S. Fejes and A. Rosenfeld, "Migration Processes 2: The Discrete Case," *J. Mathematical Imaging Vision*, vol. 8, pp. 27-40, 1998.

L. J. Latecki and A. Rosenfeld, Supportedness and Tameness: Differentialless Geometry of Plane Curves," *Pattern Recognition*, vol. 31, pp. 607-622, 1998.

Shihab Shamma

Professor,
Ph.D., Stanford University.
IEEE Senior Member;
Joint Appointment with ISR.

Research Interests

Dr. Shamma's research over the last 15 years has dealt with issues in computational neuroscience and the development of microsensor systems for experimental research and neural prostheses. Primary focus has been on uncovering the computational principles underlying the processing and recognition of complex sounds (speech and music) in the auditory system, and the relationship between auditory and visual processing. Other contributions include the development of photolithographic microelectrode arrays for recording and stimulation of neural signals, VLSI implementations of auditory processing algorithms, and the development of algorithms for the detection, classification, and analysis of neural activity from multiple simultaneous sources.

Professional Service

Action Editor, *Journal of Computational Neuroscience.*

University Service

ISR Education Committee.

Recent Publications

J. Z. Simon, D. A. Depireux and S. A. Shamma, "Represention of Complex Spectra in Auditory Cortex in Psychophysical and Physiological Advances in Hearing," *Proc. 11th Intl. Symp. on Hearing 1997*, A. R. Palmer, A. Ress, A. Q. Summerfield and R. Meddis, eds., Whurr Publishers (London), pp. 513-520, 1998.

P. Ru and S. A. Shamma, "Representation of Musical Timbre in the Auditory Cortex," *J. New Music Research*, vol. 26, no. 2, pp. 154-169, 1997.

Mark A. Shayman

Professor,
Ph.D., Harvard University.
NSF Presidential Young Investigator;
Joint Appointment with ISR.

Research Interests

Dr. Shayman's research interests are in the general area of discrete event systems, control theory, and applications to the management of communication networks. Discrete event systems (DES) are systems in which the variables take on discrete values which change asynchronously at discrete times. Many engineering systems can be represented by DES's; examples include communication networks, manufacturing systems, and transportation systems. Within the field of DES's, he is particularly interested in the supervisory control of such systems. He has been involved in the development of a new framework for supervisory control which can be used to design controllers for reactive systems as well as nondeterministic plants. By encapsulating sensor and actuator capabilities with logic to form so-called process objects, and using a single type of binary operator called masked composition to interconnect process objects, it shows promise of providing a foundation for an object-oriented approach to discrete event control.

Within network management, he is primarily interested in fault management. The goal is to develop network management systems that can automatically detect, isolate, and mitigate various faults that occur in a large communication network. The project uses tools from artificial intelligence as well as stochastic control theory.

Professional Service

Co-organizer, National Security Agency Workshop on Network Management.

University Service

ISR: Assoc. Director of Education; Executive Committee. Electrical Engineering: Chair, Faculty Search Committee; Department Council; Human Relations and Welfare Committee. Campus Senate; Graduate Committee on Applied Mathematics, Interdisciplinary Applied Mathematics Program; Gemstone Program Advisory Committee; College of Engineering Council (ISR Representative).

Recent Publications

R. Kumar and M. A. Shayman, "Centralized and Decentralized Supervisory Control of Nondeterministic Systems Under Partial Observation," *SIAM J. on Control and Optimization*, vol. 35, pp. 363-383, 1997.

R. Kumar and M. A. Shayman, "Formulae Relating Controllability, Observability, and Co-observability," *Automatica*, vol. 34, pp. 211-215, February 1998.

Charles B. Silio, Jr.

Associate Professor,
Ph.D., Notre Dame University.

Research Interests

Dr. Silio's research interests are in the area of computer network architecture and performance evaluation. Multiprocessor interconnections using a fiber optic multiple access ring network with a completely distributed, fault tolerant control mechanism are being investigated. The investigation includes Monte Carlo discrete event simulation and

analytical modeling to predict performance in varying configurations and to make performance comparisons with other networks. Designs for implementation using fiber optic links and a double ring fault-tolerant configuration in local area computer communication networks are in progress. The reliability of fiber optic ring networks is also being investigated. Work to date has concentrated on obtaining closed form expressions to predict reliability of the fault-tolerant ring network configurations proposed in the literature under various measures of reliability. FDDI network structures are of particular interest.

Professional Service

Associate Ed., *Multiple-valued Logic and Intl. Journal*; Session Chair, 27th Intl. Symposium on Multiple-valued Logic; IEEE Computer Society Technical Committee on Multiple-valued Logic Elections Subcommittee.

University Service

College of Engineering Council; Advisor, Maryland Beta Chapter, Tau Beta Pi Association; Advisor, IEEE Computer Society Student Chapter; Advisor, Engineering Honors Program; Ad Hoc Representative, Electrical Engineering Graduate Studies and Research Committee.

Recent Publications

P. Hershey and C. B. Silio, Jr., "A New Approach to Telecoms Network Management," *Telecommunications*, vol. 31, no. 8, pp. 53-57, August 1997.

H. M. Dao and C. B. Silio, Jr., "Conditional Reliability of Ring Networks," *Proc. 31st Annual Conf. on Information Sci. and Systems*, vol. II, pp. 903-907, Baltimore, Md., March 1997.

M. R. Henry, C. B. Silio, Jr., and A. B. Cooper III, "Packet Departure Rates in Ring Networks," *Proc. 31st Annual Conf. on Information Sci. and Systems*, vol. II, pp. 942-947, Baltimore, Md., March 1997.

David B. Stewart

Assistant Professor, Ph.D., Carnegie Mellon University.
Joint Appointment with UMIACS; Faculty Affiliate with ISR.

Research Interests

Dr. Stewart's research interests are centered around the combined area of software engineering for embedded real-time systems. He is interested primarily in advanced real-time operating system technology and software infrastructures that support the theory, design, implementation, and analysis of dynamically reconfigurable and reusable real-time software. Application areas of interest include all types of multi-sensor systems, such as transportation systems, consumer electronics, robotics, communications, and signal processing.

Current projects include the following: (1) design of real-time operating system mechanisms to support reconfigurable component-based software on microcontrollers and digital signal processors; (2) error detection and handling in real-time systems; (3) hardware/software co-design of a real-time operating system and an embedded microcontroller; (4) real-time multi-agent systems; (5) automated analysis, debugging, and fine-tuning of timing properties in embedded systems.

Professional Service

Local Arrangements Chair, HASE '97; Local Arrangements Chair, COMPSAC '97; Program Co-Chair, HASE '98.

University Service

Electrical Engineering: Department Council; Computer and Facilities Committee; Salary Committee; Faculty Search Committee; Director of Computing Search Committee; Ad-Hoc Committee on development of ENEE 114. UMIACS Fellowship Selection Committee; College of Engineering Committee on its World Wide Web presence.

Recent Publications

D. B. Stewart, R. A. Volpe, P. K. Khosla, "Design of Dynamically Reconfigurable Real-time Software Using Port-based Objects," *IEEE Trans. on Software Engineering*, vol. 23, no. 12, pp. 759-776, December 1997.

M. Hassani and D. B. Stewart, "A Mechanism for Communicating in Dynamically Reconfigurable Embedded Systems," *Proc. IEEE Intl. Workshop on High Assurance Systems Engineering (HASE 97)*, Washington, D.C., August 1997.

D. B. Stewart, "An I/O Device Driver Model and Framework for Embedded Systems," *Proc. IEEE Workshop on Middleware for Distributed Real-Time Systems and Software (MDRTSS 97)*, San Francisco, December 1997.

Charles D. Striffler

Professor and Associate Chair for Facilities and Services,
Ph.D., University of Michigan.

Research Interests

Dr. Striffler's general area of interest within the plasma physics field involves intense relativistic electron beams and their uses. Specifically, he has been involved in the theoretical analysis of beam transport properties, the design and understanding of collective ion acceleration systems, the design and development of high-power microwave and millimeter wave sources, and the analysis of high-power switches as a source of high quality electron beams.

Most recently, his research has included the upgrading of a state-of-the-art diode design code to include all self-fields. To date, in various design codes, the self-electric fields have been included, but the self-magnetic fields have been neglected. In intense beam diodes that involve substantial magnetic compression, these self-magnetic fields appear to have a substantial effect on the properties of the beam. In addition, low pressure gas breakdown behavior in a hollow cathode configuration has resulted in fast high-power switches and

a source of high quality electron beams. This so-called pseudospark discharge has been under investigation as an electron source, and he has been involved with numerical simulation studies of this system. Finally, he has been interested in RF-plasma interaction where surface wave physics dominates. Applications of this latter study includes heating of plasmas by RF sources, and the propagation of RF through the atmosphere. Various nonlinear processes occur in these systems and lead to radiation generation that can serve as a signature of the specific process that is occurring.

Professional Service
DOE-SBIR, Phase I and II Grants

University Service
Electrical Engineering: Associate Chair for Facilities and Services; Dept. Chair Rep. on Department Comm., Facilities and Services, Human Relations and Welfare; Dept. Rep. on College Comm., Staff Service Award, Engineering Recognition Award; Dept. Rep. on Univ. Comm., Library Liaison. Director, CPS-STS Program.

Leandros Tassiulas

Associate Professor, Ph.D., University of Maryland.
ONR Young Investigator; Joint Appointment with ISR.

Research Interests
Dr. Tassiulas' research interests are in the general area of communications and systems with emphasis on: wireless access networks, progagation-based cell planning and dimensioning: channel and power control; digital signaling in a cochannel interference environment; multihop radio networks; transmission scheduling and packet routing; time-varying topologies; satellite networks; power efficient management; high-speed networks and ATM; architectures; control and management; multimedia traffic modeling; quality of service guarantees for multimedia traffic; multiuser communications and information theory; optimization and control of stochastic systems, distributed systems and algorithms.

Professional Service
INFOCOM 97 Technical Program Committee.

University Service
ISR: Graduate Studies Committee; Masters of Systems Engineering Program Committee; Facilities Committee. Department of Electrical Engineering Graduate Studies and Research Committee

Recent Publications

L. Tassiulas, "Worst Case Length of Nearest Neighbor Tours for the Euclidean Traveling Salesman Problem," *SIAM J. Discrete Math.*, vol. 10, no. 2, pp. 171-179, May 1997.

L. Tassiulas, "Scheduling and Performance Limits of Networks with Constantly Changing Topology," *IEEE Trans. on Information Theory*, vol. 43, no. 3, pp. 1067-1073, May 1997.

P. Bhattacharya, L. Tassiulas and A. Ephremides, "Optimal Scheduling with Deadline Constraints in Tree Networks," *IEEE Trans. on Automatic Control*, vol. 42, no. 12, pp. 1703-1705, 1997.

L. Georgiadis, W. Szpankowski, L. Tassiulas, "Stability Analysis of Quota Allocation Access Protocols in Ring Networks with Spatial Reuse," *IEEE Trans. on Information Theory*, vol. 43, no. 3, pp. 923-937, May 1997.

L. Tassiulas, C. J. Su, "Optimal Memory Management Strategies for a Mobile User in a Broadcast Data Delivery System," *IEEE J. on Selected Areas in Communications*, vol. 15, no. 7, pp. 1226-1238, 1997.

V. Tabatabaee, L. Tassiulas, "Robust Routing in Networks of Mobile Radio Nodes," *Proc. 1st Conf. on Advanced Telecommunications Information Distribution Research Pgm. (ATIRP)*, pp. 305-307, January 1997.

F. Rashid-Farrokhi, K. J. R. Liu and L. Tassiulas, "Transmit Beamforming for Cellular Wireless Communications," *Conf. on Information Sci. and Systems (CISS-97)*, March 1997.

C. J. Su and L. Tassiulas, "Broadcast Scheduling for the Distribution of Information Items with Unequal Lengths," *Conf. on Information Sci. and Systems (CISS-97),* March 1997.

C. J. Su and L. Tassiulas, "Designing Broadcast Schedules for Information Dissemination to Mobile Users," *Proc. of INFOCOM97*, Kobe, Japan, 1997.

O. Ercetin and L. Tassiulas, "Information Delivery in Two-Stage Satellite Terrestrial Wireless Systems," *Proc. 2nd Conf. on Advanced Telecommunications Information Distribution Research Pgm. (ATIRP)*, February 1998.

C. J. Su and L. Tassiulas, "Broadcast Delivery with Limited Feedback," *Proc. 2nd Conf. on Advanced Telecommunications Information Distribution Research Pgm. (ATIRP)*, February 1998.

O. Ercetin and L. Tassiulas, "Satellite-Terrestrial Wireless Broadcast Networks," *Proc. 2nd Conf. on Advanced Telecommunications Information Distribution Research Pgm. (ATIRP)*, February 1998.

Leonard S. Taylor

Professor Emeritus
Ph.D., New Mexico State University.
Life Fellow, IEEE; Life Fellow, American Society for Laser Medicine and Surgery.

Research Interests
Dr. Taylor's research interests lie in applications of microwave radiation in medicine, biology, and industry. Particular projects have included the invention and design of invasive applicators for cancer therapy (the needle radiator which is in wide use), and the invention and design of microwave coagulating devices for surgical use in liver and spleen surgery (successfully tested in human trials). Other work with medical applications has included the design of miniature contact radiators for treatment of surface cancers. Other theoretical and experimental studies completed have involved the use of

microwaves in industrial diagnostic applications, such as a tool for determining the moisturization of human skin by cosmetic moisturization products, and in determining the thickness of fat in live cattle. A number of purely theoretical studies have been completed which involve the possible applications of special wave types and wave generators in producing microwave beam fields which can penetrate deeply into tissue for possible medical applications. Recently, work is concentrated on the measurement of the dielectric permittivity of the components of bone at low microwave frequencies, a critical item in the assessment of the penetration of cellular telephone radiation into the human cortex.

André L. Tits

Professor,
Ph.D., University of California, Berkeley.
IEEE Fellow;
NSF Presidential Young Investigator;
Permanent Joint Appointment with ISR.

Research Interests

Dr. Tits' main research interests lie in various aspects of optimization-based system design and robust control. The former include theoretical questions in numerical methods for optimization, novel ideas and software for interactive optimization-based design, and application of the above to the design of electrical, chemical, and mechanical systems. Current projects include the development of a fast feasible algorithm for semi-infinite optimization, and the development of graphical tools for exploration of design trade-offs. His recent work in robust control has dealt with both parametric and dynamic uncertainty, including contributions to the computation of the structured singular value and of the real stability radius, and to robust pole assignment by state feedback.

Professional Service

Assoc. Ed. at Large, *IEEE Trans. on Automatic Control*; Assoc. Ed., *Automatica* (IFAC Journal); 7th Symposium on Computer Aided Control Systems Design Intl. Program Committee; European Control Conference Intl. Program Committee. 1999 IEEE CACSD Conference Intl. Program Committee.

University Service

Electrical Engineering: Associate Chair for Graduate Studies and Research; Ex officio member of the Graduate Studies and Research Committee; Dept. Chair Representative, General Academic Affairs Committee; Chair, Ad-Hoc committee to review the MS and Ph.D. degree requirements; Chair, Search Committee for Academic Coordinator for Graduate Matters; Salary Committee. ISR: Education Program Committee; APT Committee. University: Graduate Council; Ad-Hoc Committee on Computational Science; Search Committee for University's Chief Information Officer.

Recent Publications

V. Sahasrabudhe, R. Celi and A. L. Tits, "Integrated Rotor-Flight Control System Optimization with Aeroelastic and Handling Qualities Constraints," *J. of Guidance, Control and Dynamics*, vol. 20, no. 2, pp. 217-224, March-April 1997.

A. L. Tits and V. Balakrishnan, "The Small μm Theorem with Frequency Dependent Norm Bound," *Proc. European Control Conf. (ECC97)*, Brussels, Belgium, July 1997.

A. L. Tits and V. Balakrishnan, "Phase-Sensitive Structured Singular Value," *Proc. Workshop on Open Problems in Mathematical Systems Theory and Control*, pp.. 74-76, University of Liége, Belgium, June 1997.

Steven A. Tretter

Associate Professor,
Ph.D., Princeton University.
Director, M.S. in Telecommunications Program.

Research Interests

Dr. Tretter's research interests are in the areas of communication systems and theory, digital signal processing, and error correcting codes. More specifically, he has been working on developing DSP algorithms to use in wireline modems. These include techniques for adaptive echo cancellation, adaptive equalization, carrier recovery and tracking methods, nonlinear precoding techniques, and trellis coding methods combined with shell mapping.

He is also supervising the use of the DSP equipment and software donated to the University of Maryland by Texas Instruments when they designated us as an Elite DSP Laboratory. He is helping various teams and individuals with the details of how to use these resources.

University Service

Electrical Engineering: Undergraduate Affairs Committee; Human Relations and Welfare Committee; Director, Cross-Disciplinary M.S. in Telecommunications Program; Electrical Engineering Representative for the Professional Master of Engineering Program.

Thirumalai Venkatesan

Professor,
Ph.D., State University of New York, Brooklyn.
American Physical Society Fellow;
Joint Appointment with Physics.

Research Interests

Dr. Venkatesan's research program focuses on the science and applications of thin film based multi-component materials of technological interest. Examples are high temperature superconducting copper oxides, colossal

magneto-resistive manganites, ferroelectric oxides for high dielectric constant materials, and wide bandgap semiconductors. The program includes growth of epitaxial thin films on a variety of substrates, characterization of the composition, structure and the electronic properties of these films and fabrication of novel devices based on the unusual properties of these layers. Some active projects are: superconducting spin injection transistors; resonant quantum excitation in YBCO; Ion Channeling studies of role of dynamic vibrations on transport properties of YBCO; colossal magneto-resistive Manganites and other oxides; CMOS structures on wide band gap materials such as SiC, optical emitters based on GaN and ZnO.

Emphasis is on the physics of charge transfer in the cuprates and manganites, vortex dynamics, and dynamics of transport in a spin correlated system. The research programs emphasize training in the growth and characterization of thin films of complex materials, transport measurements, device fabrication via different lithographic techniques, and device characterization. Understanding of the underlying physical mechanisms behind the fascinating properties of these materials is a common thread connecting the various projects.

The facilities used are state of the art with seven pulsed laser film deposition systems, Rutherford backscattering systems and X-ray diffractometers, atomic force microscopes, a number of superconducting magnets for transport measurements, and clean room for device processing.

Professional Service

Advisory panel: *Applied Physics Letters*; *Industrial Physicist*; ARPA; EPRI; NSF; DOE. Intl. Oxide Electronics Committee; Chair, Fourth Intl. Oxide Electronics Workshop.

University Service

Program Manager, Magnetic Oxide Film Research at the UMD NSF MRSEC on Oxides, Surfaces and Probes.

Recent Publications

R. D. Vispute, V. Talyansky, R. P. Sharma, S. Choopun, M. Downes, T. Venkatesan, K. A. Jones, A. A. Iliadis, M. A. Khan and J. W. Wang, "Growth of Epitaxial GaN by Pulsed Laser Deposition," *Appl. Phys. Lett.,* Vol 71, 1997.

C. Kwon, S. E. Lofland, S. M. Bhagat, M. Rajeswari, T. Venkatesan, R. Ramesh, A. R. Kratz and R. D. Gomez, "Stress-Induced Surface Magnetization of LSMO Thin Films," *J. of Mag. and Mag. Mat*., vol. 172, p. 229, 1997.

Z. W. Dong, R. Ramesh, T. Venkatesan, M. Johnson, Z. Y. Chen, S. P. Pai, V. Talyansky, R. P. Sharma, R. Shreekala, C. J. Lobb and R. L. Greene, "Spin Polarized Quasiparticle Injection Devices Using Au/YBCO/LAO/NSMO Heterstructures," *Appl. Phys. Lett*., vol. 71, p. 1718, 1997.

I. Takeuchi, T. Wei, F. Duewer, Y. K. Yoo, X.-D. Xiang, V. Talyansky, S. Pai, G. J. Chen, and T. Venkatesan, ""Low Temperature Scanning-Tip Microwave Near-Field Microscopy of YBCO Films," *Appl. Phys. Lett*., vol. 71, p. 2126, 1997.

I. Takeuchi, R. P. Sharma, S. Choopun, C. J. Lobb and T. Venkatesan, "Ion Milling Damage and Regrowth of Oxide Substrates Studied by Ion Channeling and Atomic Force Microscopy," *App. Phys. Lett*., vol. 70, p. 3098, 1997.

Y. G. Zhao, S. B. Ogale, R. Shreekala, Z. W. Dong, S. P. Pai, M. Rajeswari, T. Venkatesan, W. L. Cao, W. Lu and C. Lee, "Laser Power and Temperature Dependence of the Transient Photoimpedence Response of Epitaxial YBCO Thin Films," *J. Appl. Phys*., vol. 83, p. 1531, 1997.

H. Chen, R. D. Vispute, V. Talyansky, R. Enck, S. B. Ogale, T. Dahmas, S. Choopun, R. P. Sharma, K. A. Jones, A. A. Iliadis, L. G. Salamanca-Riba and T. Venkatesan, "Pulsed Laser Etching of GaN and AlN Films," *1997 MRS Proceedings on Gallium Nitride and Related Materials*, Boston, MA.

V. Talyansky, R. D. Vispute, S. N. Andronescu, A. A. Iliadis, K. A. Jones, S. Choopun, M. J. Downes, R. P. Sharma, Y. X. Li, L. G. Salamanca-Riba, M. C. Wood, R. A. Lareau and T. Venkatesan, "PLD Epitaxial TiN Contacts to 6H-SiC and GaN," *1997 MRS Proceedings on Gallium Nitride and Related Materials*, Boston, MA.

R. D. Vispute, V. Talyansky, S. Choopun, R. Enck, T. Dahmas, S. B. Ogale, R. P. Sharma, T. Venkatesan, Y. X. Li, L. G. Salamanca-Riba, A. A. Iliadis, M. He, X. Tang, J. B. Halpern, M. G. Spencer, M. A. Khan and K. A. Jones, "Pulsed Laser Deposition of Highly Crystalline GaN Films on Sapphire," *1997 MRS Proceedings on Gallium Nitride and Related Materials*, Boston, MA, 1997.

A. Gruverman, H. Tokumoto, A. S. Prakash, S. Aggarwal, B. Yang, M. Wuttig, R. Ramesh, O. Auciello and T. Venkatesan, "Nanoscale Imaging of Domain Dynamics and Retention in Ferroelectrics Thin Films," *Appl. Phys. Lett*., vol. 71, p. 3492, 1997.

S. B. Ogale, K. Ghosh, R. P. Sharma, R. L. Greene, R. Ramesh and T. Venkatesan, "Magnetotransport Anisotropy Effects in Epitaxial Magnetite (Fe304) Thin Films," *Phys. Rev*., Vol B.57, p. 1, 1998.

Uzi Vishkin

Professor,
D.S., Technion - Israel.
ACM Fellow;
Joint Appointment with UMIACS.

Research Interests

Dr. Vishkin's research interests are in the area of parallel algorithms and architectures. The main concrete motivating question guiding his parallel algorithms research has been "how to think in parallel."

This includes search for innovative paradigms and methodologies for the development of parallel algorithms. Work that he has done with this motivation is represented in textbooks on the

design of algorithms.

He is also interested in contributing to the development and understanding of underlying principles for the evolving generation of parallel computer systems, and their interplay with parallel algorithms. His most recent work on this fundamental interplay focuses on instruction-level parallelism (ILP), which has become the leading technology in state-of-the-art commodity microprocessors.

Professional Service

11th IEEE Intl. Parallel Processing Symposium (IPPS) Program Committee; 5th Israel Symposium on Theory of Computing and Systems (ISTCS'97) Steering Committee; Ed. Board, *Parallel Processing Letters*; Ed. Board, *J. of Algorithms*; New Generation Computing Advisory Board; Organizer, 17th Maryland Theoretical Computer Science Day; Third ACM Federal Computing Research Conference (FCRC) Organizing Committee; General Chair, ACM-UMIACS Workshop on Parallel Algorithms (WOPA).

University Service

Graduate Studies Research Committee; University of Maryland Senate.

Recent Publications

G. M. Landau and U. Vishkin, "Approximate String Matching," *Pattern Matching Algorithms*, Alberto Apostolico and Zvi Galil, eds., Oxford University Press, pp. 185-199, 1997.

S. M. Mueller and U. Vishkin, "Conflict-Free Access to Multiple Single-Ported Register Files," *Proc. 11th IEEE Intl. Parallel Processing Symp. (IPPS)*, 1997.

U. Vishkin, "From Algorithm Parallelism to Instruction-level Parallelism: an Encode-decode Chain Using Prefix-sum," *Proc. 9th ACM Symp. on Parallel Algorithms and Architectures (SPAA)*, p. 26-271, 1997.

Chia-Hung Yang

Associate Professor, Ph.D., Princeton University.

Research Interests

Dr. Yang's research interests are in the general area of semiconductors, including the physics, fabrication techniques, and their devices applications. One project is to realize the world's smallest transistors with channel length of the order of 10 nm. The operating principle of these new transistors is based on quantum mechanical tunneling and new electron transport phenomena in reduced dimensions. The most significant feature of these new transistors is that they are much smaller than the ultimate scaling limit of conventional MOSFETs. Another area is to study the transport and optical properties of semiconductor quantum dots, with emphasis on the role of hetero-interfaces and surfaces.

University Service

Electrical Engineering: Undergraduate Affairs Committee; Graduate Studies and Research Committee; Facilities Committee; Salary Review Committee.

Recent Publications

W. E. Zhang, F. C. Wang and C. H. Yang, "The Ultimate Scaling Limit of Semiconductor-Based Transistors," *Superlattice and Microstructures*, vol. 22, p. 417, 1997.

F.-C. Wang, C. H. Yang, M. J. Yang, R. A. Wilson and D. Stone, "An InAs Quantum Well Field-effect Transistor with 25 nm Channel Length," *Applied Phys. Lett.*, vol. 70, p. 3005, 1997.

M. J. Yang, C. H. Yang, B. R. Bennett and B. V. Shanabrook, "Evidence of a Hybridization Gap in Semimetallic InAs/GaSb Systems," *Phys. Rev. Lett.*, vol. 78, p. 4613, 1997.

C. K. Huang, W. E. Zhang and C. H. Yang, "Two-Dimensional Numerical Simulation of a Schottky Barrier MOSFET with Channel Length to 10 nm," *IEEE Trans. Electron Devices*, vol. 45, p. 842, 1998.

Donald Yeung

Assistant Professor, Ph.D., Electrical Engineering and Computer Science, Massachusetts Institute of Technology. Joint Appointment with UMIACS, Affiliate Appointment with Computer Science .

Research Interests

Donald Yeung joined the department from the Massachusetts Institute of Technology, where he received his Ph.D. degree. His research interests are in the general area of computer architecture, performance evaluation of computer systems, and the interaction between architectures, operating systems, and applications. Specifically, he is investigating the architecture of cluster-based multiprocessor systems. This research studies the design of shared memory coherence protocols that leverage fine-grain communication support, such as those found in commodity SMPs, and hardware support for such protocols as well as for efficient communication between multiprocessor nodes. Another important aspect of this research is the characterization of application behavior on such cluster-based systems.

In addition, Yeung is also investigating novel memory system designs that address the widening gap between processor and memory system performance. This research studies how to leverage application-specific information in the memory system in order to more efficiently manage data movement. Currently, a memory controller is being designed that actively moves data between main memory and processor buffers in a streaming fashion. The key is in exposing data movement explicitly to the application and/or compiler so that information about memory reference locality and data movement can be conveyed to the memory controller. An

important aspect of this research is the investigation of stream-based data movement as a general data supply technique for a broad class of data-intensive applications.

Kawthar A. Zaki

Professor,
Ph.D., University of California, Berkeley.
IEEE Fellow.

Research Interests

Dr. Zaki's research interests are in the areas of modeling, simulation, and Computer Aided Design (CAD) of microwave and millimeter wave components and subsystems. Her current research activities are in the development of precise and efficient numerical techniques for modeling complex guiding and resonant electromagnetic structures. Mode matching techniques for the determination of generalized scattering matrices of structures that cannot be described by a single coordinate system (e.g., cylindrical obstacles in rectangular enclosures) are being used to affect reduction of two orders of magnitude in computation times compared to direct numerical solutions of Maxwell's equations (e.g., using finite element or finite difference). As a result, CAD tools for the direct optimization of practical structures such as filters, multiplexers, power dividers, etc. are feasible on PC's or workstations that require seconds or a few minutes.

The work is being applied for the development of several practical systems components, including: (1) filter networks with extremely demanding characteristics in the PCN and PCS wireless networks in the newly allocated frequency spectrum; coaxial, combine, and dielectric resonator structures are used for the realization of miniature high quality filters; (2) tunable filters using planar structures in superconducting materials; tunability is achieved by either magnetic (Yig) materials or by varacter voltage controlled diodes; (3) ultra low noise oscillators using dielectric resonators or cooled sapphire resonators; and (4) miniature filter banks realized using Low Temperature Cofired Ceramics (LTCC) for application in communications and advanced radar systems.

Professional Service

1997/98 IEEE MTT-S International Symposium Technical Program Committee; Organizer, IEEE International Microwave Symposium.

University Service

Electrical Engineering: Chair, Graduate Studies Committee; Human Relations and Welfare Committee.

Recent Publications

C. Wang, K. A. Zaki and A. E. Atia, "Dual-Mode Conductor-Loaded Cavity Filters," *IEEE Trans. on Microwave Theory and Techniques*, vol. 45, no. 8, pp. 1240-1246, August 1997.

R. Levy, H.-W. Yao and K. A. Zaki, "Transitional Combline/Evanescent-Mode Microwave Filters," *IEEE Trans. on Microwave Theory and Techniques*, vol. 45, no. 12, pp. 2094-2099, December 1997.

C. Wang, K. A. Zaki, A. E. Atia and T. Dolan, "Conductor Loaded Resonantor Filters with Wide Spurious-Free Stopbands," *IEEE Trans. on Microwave Theory and Techniques*, vol. 45, no. 12, pp. 2387-2392, December 1997.

C. Wang, H.-W. Yao and K. A. Zaki, "Modeling of Conductor-Loaded Resonators and Filters in Rectangular Enclosures," *IEEE Trans. on Microwave Theory and Techniques*, vol. 45, no. 12, pp. 2479-2485, December 1997.

C. Wang, H.-W. Yao and K. A. Zaki, "Modeling of Conductor Loaded Resonators and Filters in Rectangular Enclosures," *1997 IEEE MTT-S Intl. Microwave Symp.*, pp. 797-800, June 1997.

C. Wang, K. A. Zaki, A. E. Atia and T. Dolan, "Conductor-Loaded Resonator Filters with Wide Spurious Free Stop Band," *1997 IEEE MTT-S Intl. Microwave Symp.*, pp. 1079-1082, June 1997.

C. Wang, K. A. Zaki, A. E. Atia, "Dual Mode Combined Dielectric and Conductor Loaded Cavity Filters," *1997 IEEE MTT-S Intl. Microwave Symp.*, pp. 1103-1106, June 1997.

X. Zhang, C. Wang, K. A. Zaki and K. S. Harshavardhan, "Dual Mode Patch Superconductor Cavity Filters," *1997 IEEE MTT-S Intl. Microwave Symp.*, pp. 1725-1728, June 1997.

H.-W. Yao, K. A. Zaki, A. E. Atia and T. Dolan, "Improvement of Spurious Performance of Combline Filters," *1997 IEEE MTT-S Intl. Microwave Symp.*, pp. 1099-1102, June 1997.

A. Bailey, W. Foley, M. Hageman, C. Murray, A. Piloto, K. Sparks and K. A. Zaki, "Miniature LTCC Filters for Digital Receivers," *1997 IEEE MTT-S Intl. Microwave Symp.*, pp. 999-1002, June 1997.

G. Roan and K. A. Zaki, "Calculation of Losses in a Superconductive Resonator Using FDTD," *1997 IEEE AP-S Intl. Symp. and URSI North American Radio Science Mtg.*, Montreal, Quebec, July 1997.

A. Piloto, D. Partlaw, C. Painter, S. Tolle and K. A. Zaki, "Advanced LTCC Ferrite Technology for Low Cost Phase Shifters in Emerging RF Systems," *1997 Proc. Intl. Symp. on Microelectronics*, October 1997.

R. Hersgtig, R. Levy and K. A. Zaki, "Synthesis and Design of a Cascaded Trisection (CT) Dielectric Resonator Filter," *27th European Microwave Conf.*, September 1997.

K. A. Zaki and R. Hersgtig, "Trisection (CT) Combline and Dielectric Resonator Filters," *Proc. 4th IEEE Intl. Conf. on Electronics, Circuits and Systems (ICECS'97)*, vol. 1, pp. 159-163, Cairo, Egypt, December 1997.

Y. Rong and K. A. Zaki, "Full Wave Analysis of Cylindrical Combline Resonators and Filters," *Proc. 4th IEEE Intl. Conf. on Electronics, Circuits and Systems (ICECS'97)*, vol. 1, pp. 164-168, Cairo, Egypt, December 1997.

Distinguished Lecturer Series

Each year, the Department of Electrical Engineering invites prominent leaders in electrical engineering to speak as part of its Electrical Engineering Distinguished Lecturer Series. Last year, the department hosted three Distinguished Lecturers.

Thomas Cover

Dr. Thomas Cover, Kwoh-Ting Li Professor of Electrical Engineering and Statistics at Stanford University, visited the department as a Distinguished Lecturer on Friday, October 24, 1997.

Cover delivered a talk titled "Universal Data Compression and Investment." He discussed the use of the theory of data compression in developing a universal investment algorithm that achieves the same growth rate of wealth on stocks as the best constant rebalanced portfolio based on hindsight. In his talk, Cover demonstrated his theory by illustrating performance on the New York Stock Exchange.

Cover is known for his work in information theory, communication theory and statistics. His 1972 paper on broadcast channels helped initiate modern network information theory, and he is the coauthor of the textbook, "Elements of Information Theory."

Cover received the 1990 Claude E. Shannon Award in information theory, as well as the IEEE Neural Network Council's Pioneer Award in 1993 for his work on the capacity of neural nets. He received the 1997 IEEE Richard M. Hamming medal for contributions to information theory, communication theory and statistics, and is a member of the National Academy of Engineering.

Erich Ippen

Dr. Erich Ippen, Professor of the Department of Electrical Engineering and Computer Science and the Department of Physics at the Massachusetts Institute of Technology, visited the department on Friday, April 10, 1998, as part of the Distinguished Lecturer Series.

Ippen delivered a talk titled "Femtosecond Optics," covering what he has described as a revolution in the technology of ultrafast optics. He discussed new techniques for generating femtosecond-duration optical pulses over a wide range of wavelengths and with compact all-solid-state systems, and new opportunities for scientific measurement–for optics in medicine and for ultra-broadband optical communications.

Ippen received his Ph.D. in Electrical Engineering from the University of at Berkeley California in 1968. His research interests have included nonlinear interactions in optical fibers, dye lasers, semiconductor diode lasers, ultrashort pulse generation, femtosecond optical techniques, and studies of ultrafast processes in materials and devices. Current research topics in his group involve femtosecond spectroscopy of solid-state materials, ultrafast nonlinearities in semiconductor waveguides, and ultrashort-pulse optical fiber devices.

Ippen is a member of the National Academy of Sciences, the National Academy of Engineering and the American Academy of Arts and Sciences. He is a Fellow of the American Physical Society, the IEEE, and the Optical Society of America.

Richard Karp

Dr. Richard Karp, Professor of Computer Science and Engineering and an Adjunct Professor of Molecular Biotechnology at the University of Washington, visited the department as part of its Distinguished Lecturer Series on Friday, March 20, 1998.

Karp gave a talk titled "Random Graphs, Random Walks, Differential Equations and the Probabilistic Analysis of Algorithms." He discussed three problems related to the probabilistic analysis of algorithms: multiway partitioning of a graph, the threshold for k-orientability, and proofs of unsatisfiability for random 3-CNF formulas.

Karp received his Ph.D. in Applied Mathematics from Harvard University. The unifying theme in his research has been the study of combinatorial algorithms. Much of his subsequent work has concerned the development of parallel algorithms, the probabilistic analysis of combinatorial optimization problems, and the construction of randomized algorithms for combinatorial problems. His current research is concerned with strategies for sequencing the human genome, the physical mapping of large DNA molecules, the analysis of gene expression data, and other combinatorial problems arising in molecular biology.

Karp has received the U.S. National Medal of Science, the Turing Award (ACM), the Fulkerson Prize (AMS and Math. Programming Society), and the von Neumann Theory Prize (ORSA-TIMS). He is a member of the National Academy of Sciences, the National Academy of Engineering and the American Philosophical Society.

Third Annual Research Review Day

The department hosted the third annual review of its research and education programs, called the Research Review Day, on May 7, 1998.

The day-long event, presented to industry, government laboratories, media, and local universities, attracted more than 160 people from around the country.

The Research Review day is designed to introduce local industry, government organizations, local universities and the media to the department's extensive and exciting research activities. Collaborations with industry and government organizations are emphasized, as well as opportunities for future partnerships. Programs such as the department's Industrial Affiliates Program (see page 3 of this publication) help to facilitate this university/industry interaction.

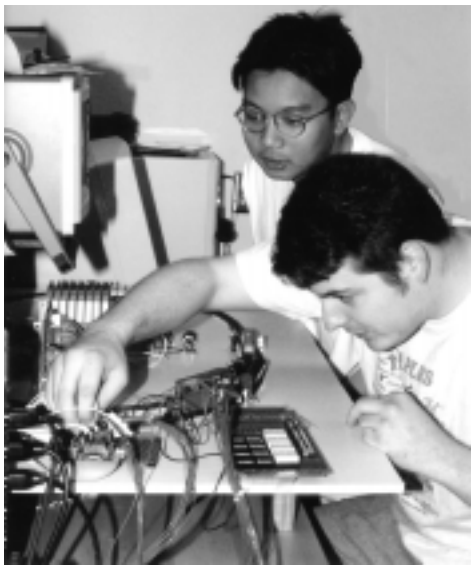
This year's event featured a morning session of talks, held at the University of Maryland University College Inn and Conference Center, and an afternoon of laboratory tours and technical poster presentations within the department's facilities.

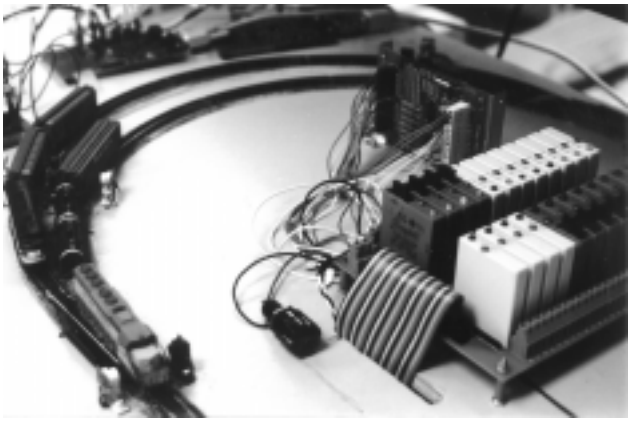
The morning session started with an introduction to the Department and College of Engineering by Prof. William Destler, Dean of the Clark School of Engineering. Prof. David Barbe, Executive Director of the Engineering Research Center, spoke next, providing attendees with a brief introduction to the Maryland Industrial Partnerships Program, which offers matching grants to industry for research collaboration with the Clark School. Ms. Heidi Sauber, Director of the Engineering Co-op and Career Service Center, spoke about how the Clark School can help industry and the government to recruit students for internships, co-ops, and full-time employment.

Three electrical engineering faculty members presented their research during the morning sessions. Prof. Christopher Davis gave a talk titled "It's a Small, Small World: New Research in Scanning Microscopy." Nariman Farvardin, Professor and Chair, delivered a talk titled "Multimedia Compression: Applications on Wireless Channels and the Internet." Prof. P. S. Krishnaprasad presented a talk titled "Control and Sensing: From Smart Machines to Smart Systems."

A buffet-style lunch was accompanied by speaker and Maryland alumnus Dr. Jeong Kim, Chairman and CEO of the former Yurie Systems, now part of Lucent Technologies. Kim spoke about how he founded Yurie, and about the advantages of Yurie's proximity to Maryland.

The afternoon session featured tours of the department's laboratories, as well as more than 160 technical poster presentations, displayed by both faculty and students.



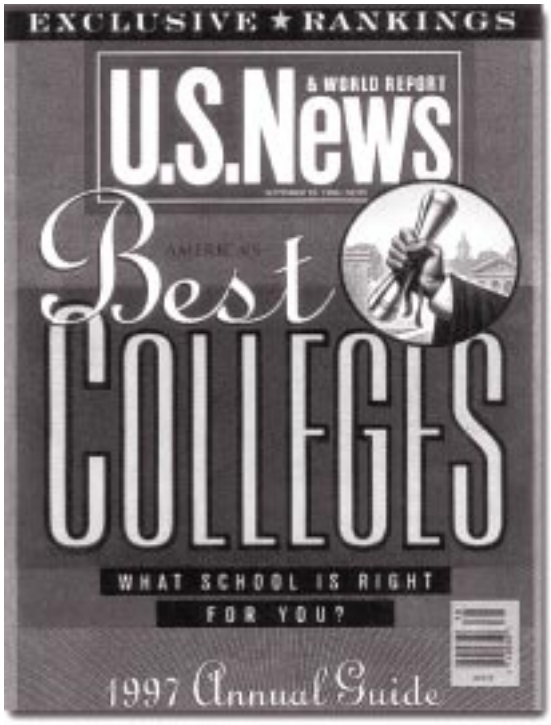


Pictured: (left) Students Angelo Capili and Thomas Carley working on the Computer Controlled Electric Trains project, also pictured on the right. The project was voted by attendees as the Best Poster/ Demo of the Research Review Day. The project's goal is to implement a computer controlled model train testbed on which to test new error handling and detection software architectures for embedded systems. This project also placed in the top ten of the 1998 Motorola University Design Contest for computer chip-based applications.

In the News

In addition to the prestigious scientific journals that faculty members' work appears in each year (see publications lists under each individual faculty member), last year the popular media began to recognize some of the outstanding research and educational accomplishments being made by the Department's talented faculty and students as well. Articles about the Department's activities appeared in *The Washington Post*, *The Baltimore Sun*, *The Associated Press*, the *Journal for Higher Education*, *National Public Radio*, the *Washington Business News*, the *Tech Gazette*, *Radio Free China*, *Channel 13 Baltimore Live Morning Show*, and the *PG-TV Evening News*.

The Clark School of Engineering at the University of Maryland is the fastest rising engineering program in the country, according to the most recent graduate program rankings by U.S. News and World Report. The Clark School's graduate program was ranked 13th in the nation last year, while just one year ago it was ranked 18th, three years ago 25th, and four years ago 37th. Significantly, the Clark School was ranked 8th among all graduate programs in public institutions.



The U.S. News and World Report survey included 219 accredited programs, which were ranked according to several measures of academic quality. The criteria for rankings were as follows, with the weights of each area in parenthesis: reputation (40%), faculty resources (25%), research activity (25%), and student selectivity (10%).


Shrinking the Transistor

Where Tiny Progress Is a Huge Deal

U-Md. Researchers Say They've Created The World's Smallest Transistor—Now They Have to Figure Out How to Mass-Produce It

Pictured (left): Prof. Chia-Hung Yang created the world's smallest transistor last year. The new transistor uses tunneling as the dominant conduction mechanism. Yang's team has fabricated a 25 nm transistor, and recently discovered how to make it as small as 10 nm. This research was featured in many print and broadcast publications, including The Washington Post (left).
Pictured (right): Prof. David B. Stewart led a multidisciplinary design project in the department whose focus was to design a pinball machine. The finished project, called Comet Commander, was featured at the world pinball championships in Las Vegas, and was covered by many publications, including the Associated Press and The Baltimore Sun.

Errata

This page contains corrections, modifications, and additions to the Department of Electrical Engineering's 1997-98 Annual Report.

Page 9
Ms. Julie O'Donnell's title appeared incorrectly. It should appear as Account Clerk II.

Page 43
In the table appearing on this page, the last contract for Prof. Steven Marcus appeared incorrectly. It should have been included under Prof. Isaak Mayergoyz's section. In addition, two more contracts/grants should have been included under Prof. Mayergoyz. The revised version of Prof. Mayergoyz's contracts and grants appears below:

Project Title	Funding Source	Amount
Mayergoyz, Isaak		
Atomic Microscopy and Surface Science	NSA	$779,641
Magnetic Disk Remanence	NSA	$1,169,998
Mathematical Models of Hysteresis	DOE	$312,160
Semiconductor Device Analysis and Design	NSA	$340,338
Semiconductor Device Modeling	NSF	$344,721
Semiconductor Device Modeling	SRC	$60,000

Page 42
In the table appearing on this page, several items under Prof. Joseph Já Já's contracts/grants section appeared incorrectly. The revised version appears below:

Project Title	Funding Source	Amount
Já Já, Joseph		
Acquisition of an ATM Network	NSF	$390,276
Advanced Ctr. For Global Remote Sensing Studies	NASA	$430,000
Connecting the Univ. of Maryland to vBNS	NSF	$350,000
Designing Practical Parallel Algorithms for Computing and Image Processing	NSF	$181,899
High Performance Computing for Remote Sensing Application	NSF	$46,200
NPACI - San Diego	NSF	$200,500
Performance & Mgmt. Of Distributed Heterogeneous Networks	NSA	$944,382

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In the table appearing on this page, two contracts/grants should have appeared under Prof. Neil Goldsman's heading. The revised version of Prof. Goldsman's contracts and grants appears below:

Project Title	Funding Source	Amount
Goldsman, Neil		
Collaborative Research Between UMD and TCAD	LSI Corp.	$30,000
Devices and Circuits by Focused Ion Beam Implementation Tech. Dev.	NSA	$500,000
Focused Ion Beam Implanted Transistors for Integrated	NSA	$247,437
Semiconductor Device Analysis and Design	NSA	$340,338
Semiconductor Device Modeling	NSF	$344,721
Semiconductor Device Modeling	SRC	$60,000

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Prof. Evaggelos Geraniotis should have been listed as Professor, Ph.D., University of Illinois, Urbana-Champaign. Joint Appointment with ISR.

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In the table appearing on this page, several items under Prof. Evaggelos Geraniotis's contracts/grants section appeared incorrectly. The revised version appears below:

Project Title	Funding Source	Amount
Geraniotis, Evaggelos		
Center for Satellite & Hybrid Communication Networks	NASA	$1,283,000
Collaborative Research on Feasibilty Study	Telesystems	$30,000
Design and Evaluation of 3rd Generation Wireless DS/CDMA Systems	Hughes	$30,000
DS/CDMA for High Data Rate SATCOM Naval Communication	NAVY	$120,000
Indoor Wireless Project	NSF	$399,986
Modulation and Coding Techniques for Atmospheric & Underwater Communication	NAVY	$616,085
Non-Gaussian Multi-Sensor Signal Processing & Exploitation of Wideband Signals	NAVY	$215,527
Power Control in a High Speed Wireless Network Architecture for Indoor Portable Communications	Phillips	$40,000

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