EECS NEWS

Department of Electrical Engineering and Computer Science

2003

University of Michigan

Building the Future

MichiganEngineering

EECS NEWS

2003

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Notes from the Chairmen

Interim Chair Richard B. Brown Brings EECS News

We hope you will enjoy this first issue of ***EECS News***, which reaches out to our alumni and friends with information about the Electrical Engineering and Computer Science Department of the University of Michigan. Many changes have taken place in the EECS Department recently, and our students, alumni, and faculty have accomplished much that we want to share with you.

EECS, which is by any metric about one-third of the College of Engineering, has recently been reorganized from three divisions into two: Electrical and Computer Engineering (ECE), and Computer Science and Engineering (CSE). CSE includes software, artificial intelligence, theoretical computer science, computer architecture and hardware. ECE covers solid-state electronics, microelectromechanical systems, analog and digital integrated circuits, electromagnetics, optics, communications, controls, and signal processing. Our graduate programs in Electrical Engineering and in Computer Science are ranked #5 and #6, respectively, by *U.S. News and World Report*.

You can read in this newsletter about the new undergraduate Computer Science Degree and the new curricula for our CS, EE, and CE degrees that were put into place Fall Term 2001. Students are reacting very positively to the new programs, which give them strong foundations in the basics of their degrees, and more flexibility than before in upper-division course selection. The degrees taught by EECS faculty produce about 400 bachelors, 160 masters, and 65 Ph.D. graduates per year. A concerted effort to make the climate in EECS as conducive to learning as possible is bearing fruit, with course evaluation scores at all-time highs, quantitative indicators steadily rising, a Student Advisory Council organized and providing input to the Administrative Committee, and a renovation being undertaken this summer to make the EECS Atrium a more comfortable place.

This newsletter could accommodate only a sampling of alumni, student and faculty news. Please see www.eecs.umich.edu for additional news, alumni contact information, and details on EECS research activities. You may be interested in the growth of external research funding in EECS, which now exceeds $42 million dollars per year ($40 million if cost-sharing is excluded, as in the plot on pages 4 and 5). EECS is full of exciting research projects being carried out by the faculty and more than 700 graduate students; in fact, our space is too full! To ameliorate this problem, we anticipate starting construction during the next year on a new CSE building, and are in the final planning stages for a major addition to our Solid-State Electronics Laboratory. These new facilities will provide space that is needed for our present and future research programs, ranging from basic research at the nano-level to advanced developments at the system level.

After serving for nearly two years as interim chair, I welcome Dave Munson as the EECS chair, and wish him and EECS the very best.

Illinois' David Munson will be new EECS Department Chair

Beginning June 1, David Munson will join the University of Michigan as the thirteenth chair of the Department of Electrical Engineering and Computer Science. Munson is a seasoned educator, researcher, and administrator with a 24-year career at the University of Illinois.

"I am completing my final year at the University of Illinois and am eagerly looking forward to joining EECS at the University of Michigan," David Munson says. "In my role as Chair, I will have the privilege of working with outstanding faculty, excellent students, a great support staff, and countless loyal alumni and friends." Munson will also hold the title of Professor of Electrical Engineering and Computer Science.

David C. Munson, Jr. was born in Iowa and received his BS degree in electrical engineering (with distinction) from the University of Delaware in 1975, and the MS, MA, and PhD degrees in electrical engineering from Princeton University in 1977, 1977, and 1979, respectively. Since 1979, he has been with the University of Illinois at Urbana-Champaign, where he is the Robert C. MacClinchie Distinguished Professor of Electrical and Computer Engineering, a research professor in the Coordinated Science Laboratory, and a part-time faculty member in the Beckman Institute for Advanced Science and Technology.

His research interests are in the general area of signal and image processing, with current work focused on radar imaging, computer tomography, lidar imaging, interferometry, and high-precision global positioning systems. He has held leadership positions in the IEEE Signal Processing Society, where he has served as president and as founding editor-in-chief of the *IEEE Transactions on Image Processing*.

Beginning June 1, David Munson will be a presence at the Department and College. "I am very tall and easy to spot, so please do not hesitate to introduce yourself!" he says.

He adds, "I look forward to getting to know our alumni, faculty, students, staff, and friends as quickly as possible so that we can work together to continue building a great EECS Department."

DEPARTMENT NEWS

The Evolving World of EECS

Curriculum and degree changes offer students more choices

"Some students know right from the beginning what they want to do. Others want to — and need to — explore all their options," says EECS Interim Chair Richard B. Brown. This need for flexibility is part of the reason that EECS made curriculum changes that allow all students to wait until the sophomore year to commit to a degree program in EECS, and that make it easier for students to change programs within EECS.

Student Brian Kim has taken advantage of this new flexibility. "I love the EECS Department at Michigan, especially because of the new undergraduate programs," says Kim. "At first, I was going into CE because I didn't want to get too much into hardware but wanted to have some knowledge of it. After finding out that hardware is really not my thing, I switched to CS, and the transition was great because I could use the hardware classes from CE as technical electives in CS. I love the program." Kim is about half way through his degree in Computer Science.

In the fall of 2001, the department redefined its Electrical Engineering and Computer Engineering degrees, and added a Computer Science degree in the College of Engineering to meet the needs of EECS students whose interests are primarily in computer theory, artificial intelligence, and software. (The EECS Department continues to teach a CS degree which is offered through the College of Literature, Science and the Arts.) The existence of the new CS degree allowed the department to more appropriately define the Computer Engineering degree so that it overlaps the two EECS divisions — Computer Science and Engineering, and Electrical and Computer Engineering — which jointly administer the program.

A major feature of all of the new curricula is that they give students more choice in the courses they take. Each of the programs has a small set of required basic courses, and allows students to select among junior-level core courses and upper-level electives. In the new EE program, for example, 7 technical courses are prescribed, and students have choice in selecting 12 technical and free elective courses. "Getting students more actively involved in planning their own curriculum is a healthy thing," says Brown. "And students have a very different attitude in courses that they choose to take."

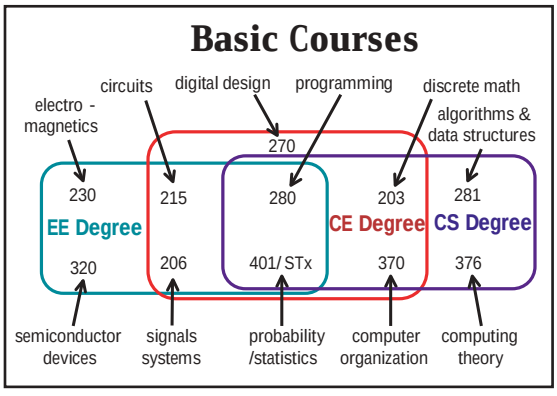
The flexibility in course selection gives students the option of gaining more depth in a particular area or the opportunity to explore more EECS topics. "Our curriculum now accommodates the breadth of our students," Brown says. "In addition to the many students who go on to graduate school in one of the EECS areas or enter the workforce after the B.S. degree, we have students who want to go into patent law, obtain an M.B.A., or become an M.D." Eric Steinke, an Electrical Engineering student, says, "I feel like I have more freedom to specialize in a certain area, making me better prepared for the work force."

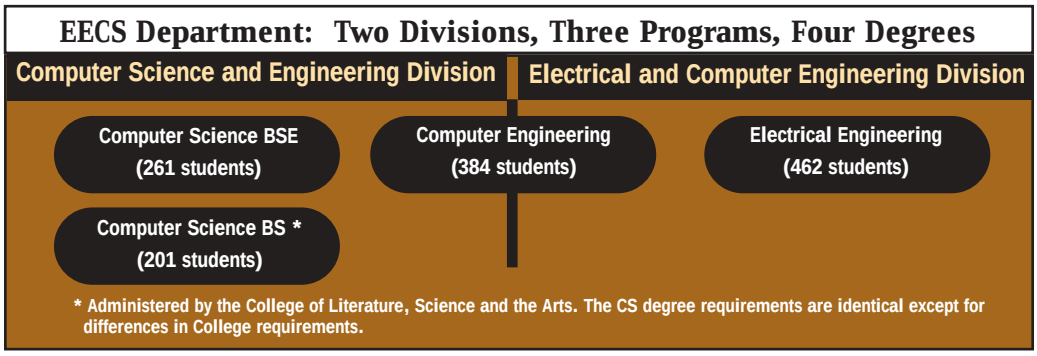
Curriculum Changes

- More flexibility as EE went from 11 to 7 specified courses
- Encourages interdisciplinary study
- CS Degree in the College of Engineering
- Properly oriented Computer Engineering degree
- Common college core and more elective hours
- Better prerequisite structure
- Hands-on Sophomore year
- Major design experience

During the dot-com fever of the late 1990s, the number of students in computer science grew to a point that strained the teaching resources, led to large class sizes, and made it impossible for students to get into all of the courses they wanted. The number of students in the degree programs has come into balance since the new degrees were defined, due in part, no doubt, to the implosion of the dot-coms and to enrollment caps which were put into place last year.

The revised undergraduate degrees have leading-edge curricula in which students are introduced to EECS fundamentals in courses that include hands-on laboratories. Students then have the freedom to choose courses of greatest interest and usefulness to their future studies and work, and complete their undergraduate education with a major design experience.





Department Receives UM/ NSF Transformation Grant

EECS was among three departments at the University of Michigan selected to receive ADVANCE grants that will be used to help transform the environment for women faculty in science and engineering. The $70,000 grant is for a three-year period. Projects will focus on recruiting, retaining, and promoting women faculty, and encouraging a climate that benefits all students and faculty, with a goal of turning EECS into a leader in women's engineering education. Highlights include a distinguished lecture series, identification of women faculty and graduating PhDs for possible hiring, and increased mentoring of junior faculty.

Student Advisory Council Created

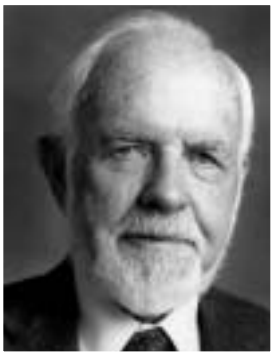
A Student Advisory Council, made up of representatives from the undergraduate and graduate EECS student organizations, now meets regularly with the department chair, associate chairs, and department administrator to discuss student and departmental issues. Among the issues addressed to date are student counseling, EECS student-guided tours for prospective students, and renovations to the EECS atrium.

EE Graduate Student Association Formed

The Association of Electrical Engineering Graduate Students (AEEGS) was formed in July 2002. AEEGS communicates EE graduate student issues to Department and College administration, offers academic and social activities, and provides opportunities for interaction between EE graduate students, faculty, and staff. AEEGS has organized an EE Mentorship Program to help incoming EE graduate students. Membership is open to any current EE graduate student at UM.

eecs.umich.edu/aeegs

Dow's Legacy Remains Strong: New Lectureship Series Created



Although he died in 1999 at the age of 104, the vibrant William Gould Dow (MSE '29) continues to contribute to the EECS department. He was often called "the Father of Modern Electrical Engineering at UM." His students and friends established the William Gould Dow Distinguished Lectureship, which recognizes the outstanding accomplishments of individuals in electrical engineering and computer science. It is the highest external honor bestowed by the department. The following individuals have been selected as Dow Lecturers:

- Robert W. Lucky, corporate vice president, Applied Research, Telcordia Technologies, 2001
- William A. Wulf, president, National Academy of Engineering, 2002
- Lester F. Eastman, the John L. Given Foundation Professor, Cornell University, 2002
- Karl J. Aström, Department of Automatic Control, Lund University, Sweden, and Department of Mechanical Engineering, University of California-Santa Barbara, 2003.

Climate Changes

"Sometimes I think engineering colleges in general — and electrical engineering departments in particular — educate their students with a boot camp mentality," says Interim Chair Richard B. Brown. "Our faculty is working to change this approach."

EECS has addressed the issue of climate through a study done by an external consultant, through discussions at faculty retreats and faculty meetings, through reducing class sizes, through reaching out to student groups, and through improved undergraduate counseling. In addition, the following climate-specific questions have been added to course evaluations:

- **The instructor treated students with respect.**
- **I developed confidence in my ability to work in the subject area.**
- **The instructor used examples that had relevance for me.**
- **The instructor accommodated students with various learning needs.**
- **Group activities in this course contributed to my learning.**
- **The size of this class has not compromised the learning experience.**

Scores on these questions have consistently improved since they were instituted in the fall of 2001. Faculty evaluation scores were at an all-time high this past term.

EECS Facts

- ***U.S. News and World Report*** Ranking
  - Electrical Engineering, #5
  - Computer Science, #6
- 8 National Academy of Engineering Members (includes 2 Emeritus)
- 86.2 full-time equivalent faculty positions
- 1308 declared undergraduate students
- 700 graduate students
- $42 million total expenditures on externally-funded research projects

Faculty Awards

Departmental Awards

2003 EECS Outstanding Achievement Award
Martha Pollack
Jeffrey A. Fessler
Fred Terry

Special EECS Award for Outstanding Teaching
Mark Brehob

2003 Eta Kappa Nu Teaching Award
Stephen Reinhardt

2002 Tau Beta Pi Teaching Award
Demosthenis Teneketzis

College Awards

Stephen S. Attwood Award
David L. Neuhoff

Research Excellence
Alfred O. Hero

Education Excellence
Theodore B. Norris

Service Excellence
James S. Freudenberg

Outstanding Research Scientist
Victor Yanovsky

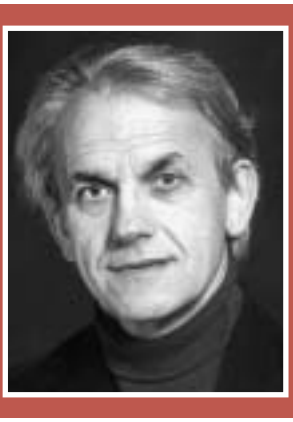
Ruth and Joel Spira Outstanding Teaching
Dennis Sylvester

College Professorships

Bredt Family Professor of Engineering
Trevor Mudge

Claude E. Shannon Professor of Engineering Science
John P. Hayes

Morris Wellman Faculty Development Assistant Professor
Brian Noble



Mourou Elected to National Academy of Engineering

Gérard A. Mourou was elected to the National Academy of Engineering (NAE), the most significant recognition of professional achievement offered by the profession. Mourou is the A.D. Moore Distinguished University Professor of Electrical Engineering, Professor of Applied Physics, and Director of the Center for Ultrafast Optical Science.

University Awards

Harold R. Johnson Diversity Service
Anthony W. England

William Gould Dow Distinguished University Professor
Kensall D. Wise

National Awards

Young Faculty Awards

NSF Career Awards
2002: Igor Guskov, Dennis Sylvester
2003: Jamie Phillips

Sloan Research Fellow
2002: Todd Austin

Society Fellows

Am. Inst. for Medical and Biological Engineering
Jeffrey A. Fessler

American Physical Society
Herbert Winful

Other Awards

Optical Society of America, Nick Holonyak, Jr. Award
Pallab K. Bhattacharya

IEEE Control Systems Society, George S. Axelby Award
Jessy W. Grizzle

IEEE Information Theory Society Service Award
David L. Neuhoff

Outstanding Young Engineer of the IEEE Microwave Theory and Techniques (MTT) Society
Gabriel M. Rebeiz

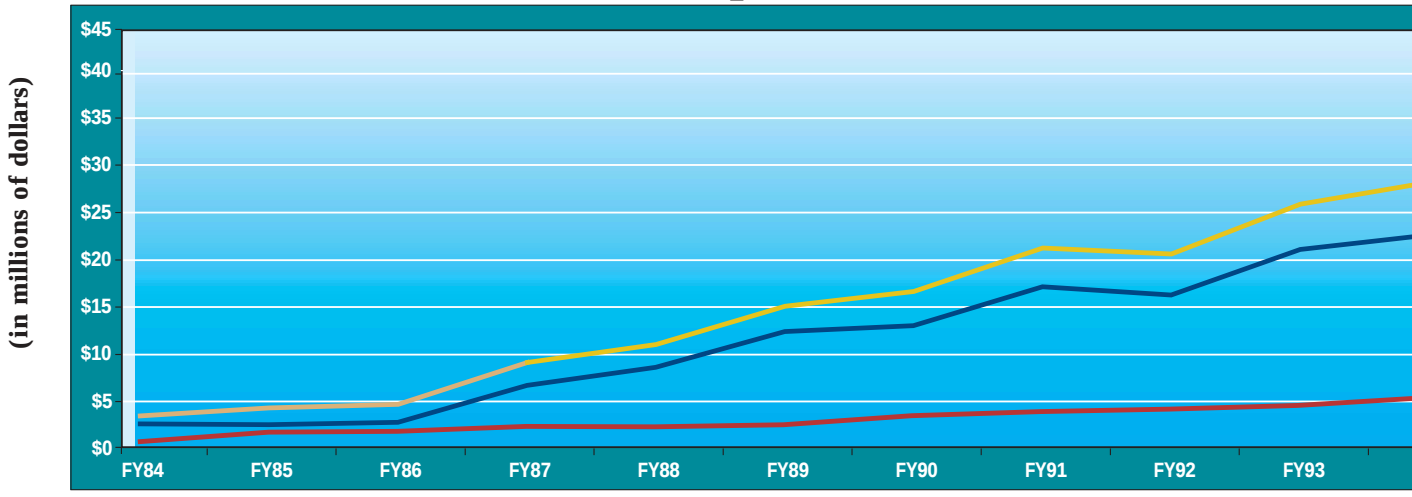
MILCOM (Military Communications Conference) Technical Achievement Award
Wayne E. Stark

U.S. Geological Survey, Dept. of the Interior, William T. Pecora Award
Fawwaz T. Ulaby

Staff Awards

Wait Wins UM OVPR Award
Virginia Wait (MBA '88), the Department's Administrative Manager, was honored with the 2002 Distinguished Research Administrator Award from the Office of the Vice President for Research. Interim Chair Richard Brown says, "We have all benefited from Virginia's excellent administrative work on the financial side of our research projects, from her support and training of our research administrators

EECS Department



throughout EECS, and from her knowledge of University policy." Wait is chair of the Sponsored Program Implementation Team (SPIT), which is making recommendations to improve efficiency and enable research throughout the University.

College of Engineering Staff Excellence Awards

William R. Knudsen, Engineer in Research III, Solid-State Electronics Laboratory

As an engineer in research for the SSEL, Bill Knudsen is responsible for maintaining the thermal furnaces used in semi-conductor fabrication, enabling them to run better and more reliably than ever. The unsung hero of many publications and grant proposals, Knudsen provides a high level of service and flexibility to the Lab and its customers. His citation lauded him for being "a patient and complete teacher and mentor to those around him, he gladly shares his knowledge with others."

Jeanne Patterson, Exec. Secretary, CSE Division

Jeanne Peterson is the administrative support person for the CSE Associate Chair. She also supports the CSE faculty search committee, where she arranges the job interviews held during the annual 12-week recruiting season. She estimates that she has arranged 2,200 appointments with more than 120 faculty candidates in the last five years. From helping faculty members who are ill to editing dissertations for non-native speakers of English, Patterson gives her expertise generously and enthusiastically to anyone who needs her.

Three New Faculty Join EECS

Satinder Singh Baveja
Associate Professor, Artificial Intelligence

Professor Baveja received his B. Tech in Electrical Engineering from the Indian Institute of Technology, New Delhi, 1987, and his MS and PhD in computer science from the University of Massachusetts in 1991 and 1993, respectively. Before joining UM, he was chief scientist at Syntek Capital, New York; principal technical staff member in the artificial intelligence department at AT&T Labs-Research; and assistant professor in the department of computer science at the University of Colorado-Boulder. His research is in machine learning with a specialization in reinforcement learning.

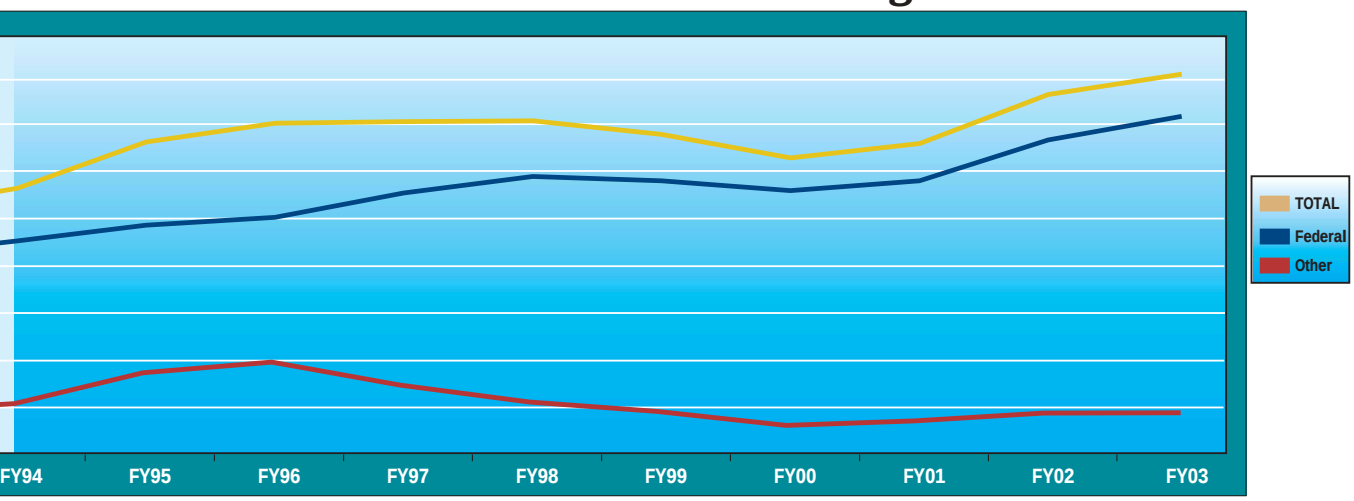
Jason Flinn
Assistant Professor, Software Systems Laboratory

Jason Flinn received his BSE in computer science and engineering and BS in economics from the University of Pennsylvania in 1991, his MS in computer engineering from Syracuse University in 1996, and his PhD in computer science from Carnegie Mellon University in 2001. He was a postdoctoral intern at Intel Research before he joined the UM faculty. His research is in power-aware computing systems, services, and applications.

Yaoyun Shi
Assistant Professor, Theory

Yaoyun Shi received his BS in computer science from Beijing University, Peoples Republic of China, in 1997, and his MA and PhD in computer science from Princeton University in 1999 and 2001, respectively. He was a postdoctoral scholar at the Institute of Quantum Information at California Institute of Technology. His research is in the theory of computation and quantum computing. (See article about quantum computing on page 13.)

External Research Funding



Retirement

Spence BeMent, Janice Jenkins, Ward Getty

Prof. Janice M. Jenkins "Retires"

"Life is good," Janice Jenkins says, "and my industrial efforts have been particularly good. This is all a nice coda to a late engineering career. But the students are still the best part." During her 22-year UM career, Janice Jenkins became known for her mentorship and dedication to the development of the next generation of research engineers — and for the fact that she was the first woman faculty member hired in the EECS department.

"The most unusual part of my academic career," Jenkins says, "is the fact that I raised five kids (typical stay-at-home housewife), and started college when my oldest started college. I was 37. I got my PhD at the age of 46, and was appointed an assistant professor at Michigan at the age of 48. I wasn't as worried about being discriminated against for being female, as I was worried about age discrimination! I didn't tell anyone how old I was (but I did send a picture with my CV so as not to fool anyone). I looked like I was in my 30s (good genes). I won the NSF Presidential Young Investigator award when I was 52. Probably (without doubt) the oldest Young Investigator ever. I was a grandmother!"

Jenkins still has an active NSF grant at UM and travels here regularly, supervising the research of two graduate and three undergraduate students. "I haven't stopped my active professional life," she says. "I also have a major role in an NIH/SBIR grant, and am directing clinical studies at Loyola University Medical Center." Jenkins now lives in Chicago in her dream condo overlooking Lake Michigan.

Professor Jenkins received her BS, MS, and PhD degrees from the University of Illinois at Chicago in 1974, 1976, and 1978, respectively. She was an assistant professor of electrical engineering and computer science, and of medicine, at Northwestern University from 1979-1980. In 1980, she joined the UM faculty as an assistant professor of electrical and computer engineering, and was promoted to professor of electrical engineering and computer science, and of biomedical engineering, in 1992.

At UM, Jenkins made important contributions to automated arrhythmia analysis using advanced signal processing and computer techniques. She was director of the medical computing research laboratory (1981-2002), and of the digital design laboratory (1983-1998), an instructional laboratory on the design of microprocessor based systems that she initiated and taught.

"I was always treated appropriately," Jenkins says. "No discrimination, nor any patronizing. My colleagues caught on quickly that I wanted to carry my own oscilloscope (they offered for a while), but I did let them open the door for me while I was burdened. There were 55 male faculty members, and they were always collegial and proper."

In 1991, Jenkins received the UM Sarah Goddard Power Award for her outstanding professional achievements and contributions to the education of women, and the NSF Faculty Award for Women in Science and Engineering. Jenkins is a Fellow of the Institute of Electrical and Electronics Engineers, the American Institute for Medical and Biological Engineering, and the American College of Cardiology. She has four patents, and another pending. She has supported, mentored, and graduated 20 PhD students and eight MS thesis students.

Upon her retirement from active faculty status in December 2002, the UM Regents named Janice Jenkins Professor Emerita of Electrical Engineering and Computer Science.

"It's been a wonderful and inspiring 'second career,'" Jenkins says. "Like having a bunch of kids again. Except they are brilliant students, don't sass you, always take your advice, look up to you, and best of all, I don't have to pay their car insurance!"

Building the Future

New Computer Science and Engineering Building Signals Better Communication for Students and Faculty

Rendering courtesy of Diamond and Schmitt Architects Incorporated

In October 2002, the University of Michigan Regents approved the building concept, location, and $40 million budget for a new Computer Science and Engineering building that will change the face of North Campus — and enhance teaching, research, and a sense of community. Construction is planned to start next spring; completion is slated for 2006.

"The building concept and design are geared toward communication among faculty, students, and staff," says Toby Teorey. "Here is a facility where people will have plenty of opportunity to meet and discuss. This is a place where students will want to meet."

When the EECS Building opened in 1986, it marked the completion of the College of Engineering's 30-year move from Central Campus to North Campus. But, from the beginning, the building was bursting at the seams. The new CSE building is a solution to two decades of crowded conditions.

The structure will be built west of the Dow Building, into the hill. All CSE faculty, staff, student offices, and labs from both the EECS Building and the Advanced Technologies Laboratory (ATL) will move to the new building.

Timeline

October 2002	UM Regents approve building concept, location, budget, and architect
April 2003	UM Regents approve schematic design
September 2003	UM Regents expected to approve bid for construction
Spring 2004	Start construction
Spring 2006	Occupy building

For faculty members and graduate students, there will be more research labs, conference rooms, and lounges.

For undergraduates, there will be two Computer-Aided Engineering Network (CAEN) labs, a learning center, and student project space.

The new building also will contain two large classrooms (60 seats and 120 seats).

"The building is designed to handle 56 faculty, including lecturers," says Teorey. "We have 42 full-time faculty now and can grow comfortably. Faculty are very excited about the project."

And so is College administration. College of Engineering Dean Stephen Director says, "Computer science and engineering is one of the core strengths of the college. This building will provide state-of-the-art facilities that are needed to maintain and grow our educational and research programs. By housing these activities in one building, we gain important synergy."

Diamond and Schmitt Architects, Inc. won the design bid for the 100,000-gross-square-foot building. The award-winning Toronto firm was formed in 1975 and has completed projects all over the world, from the U.S. to the People's Republic of China. Locally, they designed Detroit Symphony Hall's renovation.

Principle Donald Schmitt notes that the building site steeply slopes more than two stories in height. "We turned this to advantage by creating a series of terrace gardens on three levels." These gardens form a public promenade from graduate student housing to the north through the heart of North Campus.

According to Schmitt, "Our vision for the design is focused on places of meeting: an interior skylit court with a linear stair that follows the slope of the hilly site connects all floors. The court and the stair will be places of meeting, creating an open forum of collaboration."

"We hope to make this building a University of Michigan landmark," says Schmitt, "one that will be commensurate with the stature of the remarkable faculty and students."

"The design process has been great," says Laird. "The architects have listened to all of our comments and worked

"A place where students will want to meet"

them into a stunning design. All through the process, we have found ways to achieve our goals of creating a fantastic place for teaching and education. This will be one of the most interesting buildings on campus, both inside and out."

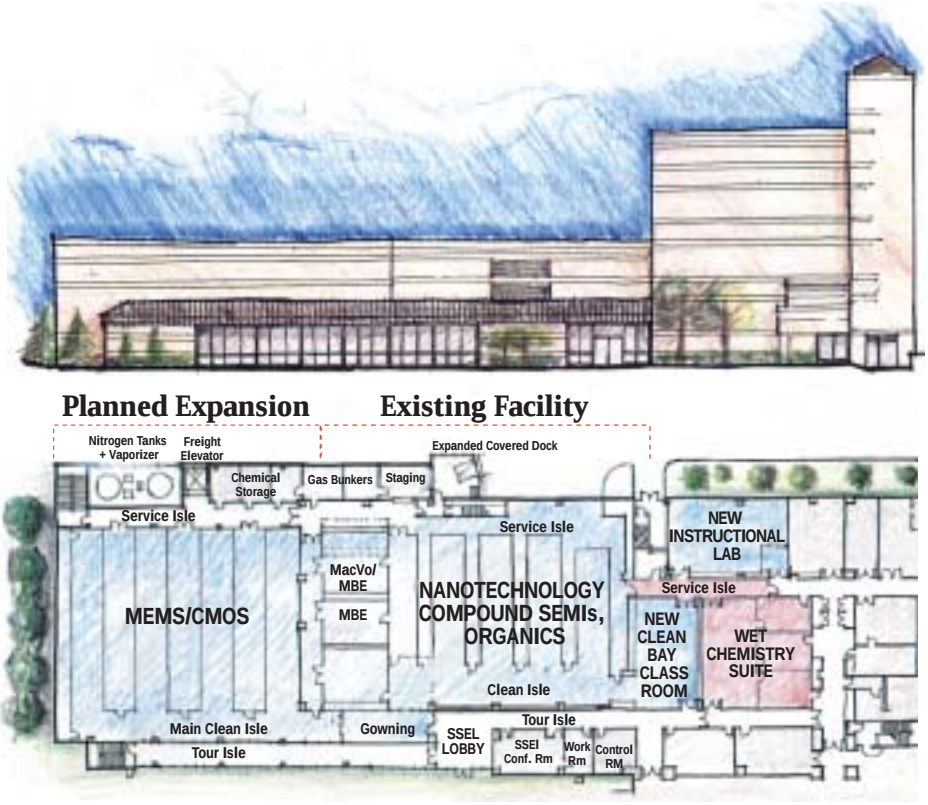
"For alumni," says Laird (Michigan, BS '75), "all I can say is that I wish we had this building when they (and I) were students here."

For more information, see www.eecs.umich.edu/eecs/eecs_info/csebldg/. Look for the Web cam when construction starts.

Building Features

- State-of-the-art learning center (will include two CAEN labs; areas for individual study, group study, and tutoring)
- Natural light in most offices
- Special labs for robotics, mobile computing, security experimentation
- Common areas (great hall, courtyard, student areas, and more)
- Public demonstration facilities
- Networking infrastructure for wireless computing and communications, and remote interactions
- 104,000 gross square feet (60,000 net square feet). "Gross" footage includes hallways, common areas such as atriums, etc. For comparison: The EECS Building is 220,000 gross square feet (100,000 net square feet).

Solid-State Electronics Laboratory Will Grow More Research



"We reach our capacity of about 40,000 hours of use every year, but it's not enough to meet our research needs," says Dr. Dennis Grimard, manager of the Solid-State Electronics Laboratory (SSEL). "To allow for increased use, we will need to expand the laboratory." A $28 million renovation and expansion will make the lab more effective for existing faculty, external users, and new faculty who are joining the University with new research projects.

The expansion will add about 5,200 square feet of clean room space to the existing Class 100 and Class 10 clean rooms. In the existing 12,000-square-foot Laboratory, wet labs will be renovated and added, and dry labs will be renovated. Work should start in spring 2004. Anticipated completion is fall 2005. The architects are the Smith Group; AGI Consulting will handle the clean rooms.

Prof. Khalil Najafi, Director of SSEL since 1998, has been working for the past couple years with the College and the architects to define the new space. "We have a unique opportunity with this lab expansion to address the needs of UM faculty and students in all aspects of micro and nano technologies for the next decade," says Prof. Najafi, "and we are already looking for ways to allow and encourage an increasing number of non-UM researchers and scientists as well as companies to use the SSEL facilities for their work." The renovation and expansion will double, and possibly quadruple, the number of SSEL users.

The present Solid-State Laboratory came to life in 1986 when the University of Michigan and the State of Michigan established the facility as a catalyst for high technology in the Midwest.

Today, SSEL is the largest lab in the College of Engineering, generating more than $12 million in research funding each year. At the forefront of research in microelectronics and optoelectronics, with complete facilities for solid-state device and circuit fabrication, the lab runs 24 hours a day, seven days a week.

"Great research has been and is being done here," says Grimard. "With space limitations gone, our users will be limited only by their own creativity."

Read more about it

See page 11 to read about the Center for Wireless Integrated Microsystems (WIMS), one of the major users of the Solid-State Lab.

www.eecs.umich.edu/ssel

Tech Transfer in the New Economy: Why EECS Leads the Pack

In an uncertain economy, new start-up companies seem fewer and farther between. Yet, the crucial elements that start-ups are made of — disclosures, patents, and licensing — are on the rise at the College of Engineering. And EECS is leading the pack.

Since 1999, the number of technology disclosures submitted by College of Engineering researchers has essentially doubled. Last year, Engineering researchers submitted 99 disclosures. This year's pace already is significantly higher, with 97 disclosures already submitted by the close of the third quarter. According to Mark Maynard (BA '93), Marketing Manager for the UM Office of Technology Transfer (OTT), "In the last three years of available data, EECS has represented about half of these disclosures — and approximately half of the technologies being licensed from the College of Engineering."

The Right Place at the Right Time

EECS is a natural for technology transfer.

"While you may drive a car that is 10 years old, you'd never use a computer or cell phone that was anywhere near that age!" says Tim Faley, Director of the College of Engineering's Office of Technology Transfer and Commercialization (TT&C). "The short product life cycle of software and electronic devices means that new technologies, including those developed in EECS, are more quickly commercialized — or 'productized' — than technology that mainly benefits other industries. Licensing of EECS-developed technologies definitely benefits from this strong market pull."

Combine strong market pull with successful research and you have the potential for an irresistible combination.

Until recently, few research institutions were concerned with aggressively growing research into marketable applications. Tech transfer was something that "happened to you" if you were lucky. You didn't seek it out, and you didn't set the stage for making it happen. But things have changed.

Between 2000 and 2002, University-wide technology licensing revenues at the University of Michigan reached $17.9 million — an almost 50 percent increase over the previous three-year period. During this same period, the number of UM start-up companies being formed jumped from 15 to 25, issued patents increased from 171 to 198, license and option agreements from 131 to 181, and disclosures from 501 to 587.

UM Support for Tech Transfer

In 1996, the University established a new Regents' policy that urged Schools and Colleges to support their faculty's technology transfer efforts. The policy also provided better incentives for participation, more flexible research policies and encouraged consideration of startup companies.

The result was an increased investment in the Office of Technology Transfer, the creation of a New Business Development function to facilitate startups, and later the creation of satellite Tech Transfer offices in the College of Engineering and the School of Medicine.

> **"Tech Transfer is the mechanism by which we pay our community back."**
> **- Prof. Elliot Soloway, creator of GoKnow**

Concurrently, a Technology Transfer Commercialization program was created, which has increased Engineering faculty participation and success.

Professor Elliot Soloway says, "Today, the UM administration view is to get out of the way and let good folks do their work. That's what the EECS department has done. Thank you, EECS." Soloway's company, GoKnow, grew from research he conducted at UM.

"Without technology transfer, much of the most useful engineering research will suffer a long lag in real-world understanding or adoption. It is vital to the United States and the world that technology makes its way to the market as quickly as possible," says Professor William J. Williams. "The kinds of technologies being developed in EECS and at UM may provide solutions to critical problems if appropriately transitioned. After all, isn't engineering all about solving problems?"

Williams is co-founder and chief scientist for Quantum Signal, a start-up company created with OTT help. Williams started Quantum with a portion of the research conducted at UM and relied upon OTT for several practical matters, even a solution to affordable, professional office space, which the successful company outgrew in two years.

As an emeritus faculty member who has seen both sides of the process, Williams is enthusiastic. "Many junior faculty members and enthusiastic students will benefit from the new encouraging, supportive, and open technology transfer policies," he says.

Success Breeds Success

Dr. G. Robert Malan (MSE '96, PhD '00), Arbor Networks' co-founder and chief technical officer, says, "Tech transfer allowed us to take our technology beyond traditional academic forums and make a much broader impact."

Malan was EECS Professor Farnam Jahanian's graduate student. In the late 1990s, Malan and Jahanian decided to create a commercial version of their research prototype which was originally created to protect UM's Merit educational network from denial-of-service attacks. Today, their company has more than 70 employees. Government agencies, service providers, and corporations use their flagship product, Peakflow, to protect critical networks. And in 2002, Red Herring deemed Arbor Networks a Hot Young Company to Watch.

"I credit Tech Transfer with helping us move through the start-up process judiciously and get our technology to market quickly," says Malan.

One hotbed of EECS research activity is the Center for Ultrafast Optical Science. CUOS has licensed technology to Clark-MXR (laser manufacturing), Picometrix (high-speed information processing), Translume (telecommunications), and IntraLase (medical surgery).

IntraLase resulted from a collaboration between the UM Kellogg Eye Center's Dr. Ronald Kurtz and CUOS. IntraLase's ultrafast, minimally invasive lasers are used in next-generation eye surgeries,

including vision correction, corneal transplants, and glaucoma treatment.

"CUOS research holds promise for additional spinouts based on recently submitted patent disclosures and existing patent awards," says Peter Pronko, Emeritus Research Scientist. "There are opportunities in equipment manufacturing and associated production operations in isotope enrichment, intense x-ray generation, micromachining, and nanotechnology, to name a few."

But sometimes, even the best intentions are not enough. Start-ups need money — and, usually, lots of it.

Funding the Future

Increasingly, UM Tech Transfer is collaborating with venture capitalists to form startup companies — forging the link between new technology and the marketplace. One Ann Arbor-based venture capital company, Ardesta, has been instrumental in launching several companies. Three of these were launched from EECS: Sensicore, Discera, and Translume.

"Tech transfer certainly has improved in the state of Michigan in the past five years. The universities have made tech transfer a higher priority and have hired good people to lead these efforts," says Christopher Rizik, Ardesta's Senior Vice President. "But creating an effective technology transfer program is difficult and time consuming. The challenge is to make and keep tech transfer a high priority from administration to administration so that a consistent message is sent to professors and to outside parties looking to work with the universities."

Since the TT&C office opened, the College of Engineering has annually sponsored a $150,000 gap fund that is administered by the TT&C office. The purpose is to bridge the gap between research and commercialization. "Faculty and staff have used this fund to create product prototypes, produce sample materials, expand the scope of a patent applications, and so forth," says Faley. The proposal process for this fund has been very competitive. Last year, the faculty advisory committee received proposals requesting nearly $800,000.

Mission Statements

When talking with the people behind the EECS start-ups, three things emerge: the excitement of developing a new business, a commitment to making a difference for society, and an eagerness to hire EECS graduates.

"Our research findings say that our materials can help children learn," says Elliot Soloway. "At GoKnow, we try to scale our university research effort to all children in America. We want to have an impact."

"The best aspect of starting Discera is the company's potential to make a difference — to bring vibrating MEMS technology to the commercial market, where it can improve the quality of lives for people across the world," Professor Clark T.C. Nguyen says. "Equally exciting, however, is how Discera's creation has already generated entrepreneurial appetites in students graduating from the EECS Department."

Rather than looking to work for large companies, where it can be more difficult to make a visible difference quickly, students hold onto to their own ambitions and dare to join start-ups, where, Nguyen says, "The risk is higher, but the potential to influence society much greater."

Rob Malan, Arbor Networks, agrees, "Building products that work, are deployable, and generate enough revenue to sustain a company of people and their families is amazingly gratifying."

And for all of these companies, hiring UM graduates seems to happen naturally. "These people know the technology because they helped develop it, they are bright and well educated, and they want to live in Michigan," says Richard Brown, the founder of Sensicore.

The Final Word

Perhaps Soloway sums up everyone's mission statement best: "We at the University are in a privileged spot; we are supported in following our muses," Soloway says. "Tech transfer is the mechanism by which we pay our community back for this unique opportunity. Tech transfer is something that all faculty members should do to say 'thank you' for the privilege to think and work as we see fit."

Read more about it!

Visit the UM Tech Transfer organization at www.engin.techtransfer.umich.edu for more information on EECS startup companies, College of Engineering technologies available for licensing, and resources for faculty.

EECS Tech Transfer Dozen

Since 1995, 12 start-up companies have been formed based on EECS-developed technology. The results are tangible — and the benefits for society are great.

Arbor Networks
www.arbornetworks.com
Ann Arbor, MI, and Boston, MA

Clark/MXR, Inc.
www.cmxr.com
Dexter, MI

Discera
www.discera.com
Ann Arbor, MI

EMAG Technologies Inc.
www.emagtechnologies.com
Ann Arbor, MI

GoKnow
www.goknow.com
Ann Arbor, MI

IntraLase
www.intralase.com
Irvine, CA

Integrated Sensing Systems (ISSYS)
www.mems-issys.com
Ypsilanti, MI

Picometrix, Inc.
www.picometrix.com
Ann Arbor, MI

Quantum Signal
www.quantu.signal.com
Ann Arbor, MI

Sensicore
www.sensicore.com
Ann Arbor, MI

Translume
www.translume.com
Ann Arbor, MI

Xtera
www.xtera.com
Dallas, TX

Going Wireless — and small: THE NEXT BIG THINGS

In Isaac Asimov's 1966 science fiction classic, *Fantastic Voyage*, scientists are reduced to a microscopic fraction of their size and sent in a miniaturized atomic submarine through a dying man's carotid artery to destroy a blood clot in his brain. Asimov predicted the concept of integrated microsystems, where scientists' skills and technology are made smaller for ease of use — and a cadre of communications devices monitor their progress. A few years later, the University of Michigan actually pioneered the use of sensors and microflowmeters within the coronary arteries of the heart. Today, through a new National Science Foundation Engineering Research Center, UM is taking such microsystems and communications devices to the next level — by going smaller and wireless.

"Our Engineering Research Center (ERC) for Wireless Integrated MicroSystems (WIMS) focuses on miniature low-cost integrated microsystems that will measure or control physical parameters, interpret the data, and communicate over a bi-directional wireless system," says Ken Wise, director of the Center. Wise is the J. Reid and Polly Anderson Professor of Manufacturing Technology, and the William Gould Dow Distinguished University Professor of Electrical Engineering and Computer Science.

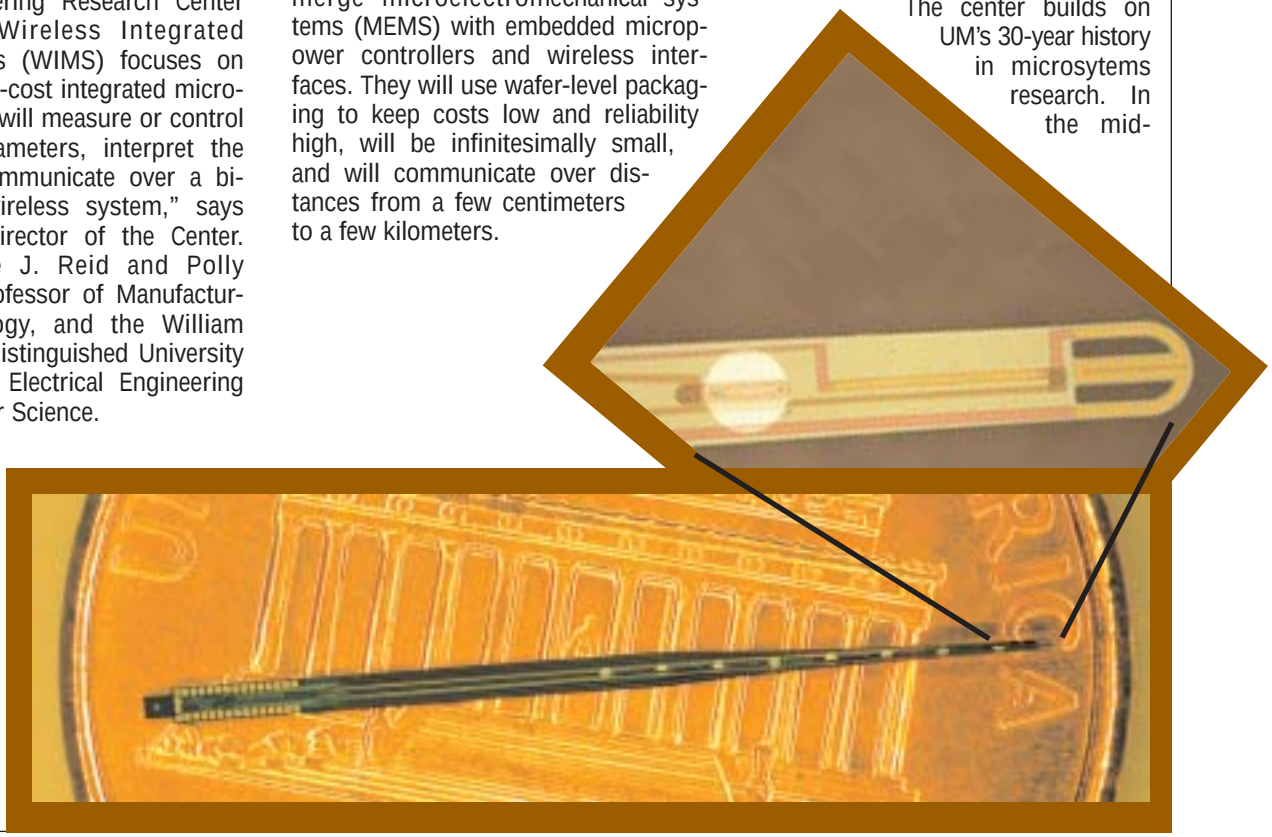
"The goal of the Center," says Wise, "is to develop systems that are rapidly configurable, reconfigurable, and self-testing."

UM researchers predict that WIMS will gather information directly from the environment. Miniature information-gathering devices will be used for process control, transportation systems (in smart vehicles and smart highways, for example), environmental monitoring (for weather, global change, air and water quality), and improved health care (for wearable and implantable biomedical systems).

"As we look ahead to the coming decade, there's little question that integrated microsystems will increase in capability and, for many applications, go wireless, fueled by the demand for low-cost portable information gathering," says Wise. The Center's philosophy is that these microsystems will merge microelectromechanical systems (MEMS) with embedded micropower controllers and wireless interfaces. They will use wafer-level packaging to keep costs low and reliability high, will be infinitesimally small, and will communicate over distances from a few centimeters to a few kilometers.

Residing within the Department of Electrical Engineering and Computer Science, this is the first WIMS center in the United States. Such National Science Foundation centers are the jewel in the crown of a research area. To harness the best of the best, UM collaborates with Michigan State University and Michigan Technological University. UM researchers include scientists from most of the College of Engineering disciplines as well as from Chemistry, Public Health, and Medicine. Additional funding comes from the National Institutes of Health (NIH) and the Defense Advanced Research Projects Agency (DARPA). To encourage technology transfer, the Center works with the State of Michigan and an industrial partnership program involving more than 20 companies representing the microelectronics, automotive, chemical, and medical industries.

The center builds on UM's 30-year history in microsytems research. In the mid-



Electrode array for cochlear prosthesis: The array is made so that it can be threaded into the spiral cochlea of profoundly deaf patients, bringing the electrodes into close proximity with nerve cells. WIMS faculty and students are developing technologies that will facilitate full implantation of cochlear prostheses and improve the fidelity of sound that patients hear.

1970s, UM researchers developed the first monolithic silicon pressure sensor with on-chip readout circuitry, and then extended the technology as a basis for commercial products such as infrared devices, accelerometers, and gyros. That research has helped make possible advances in biomedicine, adaptive process control, environmental monitoring, space instrumentation, defense, and transportation systems.

Current research is organized into four major areas: micropower circuits, wireless interfaces, sensors and microinstruments, and micro-packaging. Two application testbeds are in the works. The first is a radio-frequency-powered implantable microsystem expected to significantly improve the performance of cochlear prostheses for the profoundly deaf. Researchers plan to extend that technology to devices for treating epilepsy, Parkinson's disease, and other neurological disorders. The second testbed is a battery-powered wristwatch-size environmental monitoring system capable of gas analysis as well as measuring barometric pressure, temperature, humidity, and other variables.

"Because WIMS uses structures where coupled, thermal, electrical, mechanical, and optical sensitivities are present, the research area demands engineers with broad interdisciplinary backgrounds who are comfortable dealing with such structures," says Wise. "The fact that WIMS cuts across such a broad swath in engineering is both a challenge and an opportunity."

One of the opportunities in WIMS is associated with education. Wise says, "The very nature of WIMS devices — as physical entities — makes them ideal tools for illustrating basic principles in science. A large component of the ERC funding involves education." The Center's activities include programs at the pre-college, undergraduate, graduate, and professional levels. After a master's emphasis in microsystems is created, work will begin on a microsystems major at the doctoral level.

"In addition to research that will directly benefit society, MEMS/WIMS is being used to encourage more young people to go into engineering. And distance learning technology is being used to ease the entry of practicing engineers into microsystems from a wide variety of disciplines," Wise says. "It's a great recipe for success."

www.eecs.umich.edu/wims

Victor Yanovsky with HERCULES.

A Herculean Feat

On May 8, a University of Michigan EECS team conducted a laser experiment that resulted in the highest laser intensity ever produced by humankind. The experiment was demonstrated on a National Science Foundation-supported laser known as "Hercules" — High-Energy Repetitive CUos Laser System. This remarkable result capped a two-year effort by Research Scientist Victor Yanovsky and his team, Vladimire Chvykov, Galina Kalintchenko, Seung-Whan Bahk, and Associate Research Scientist Anatoly Maksimchuk. The results were immediately duplicated on another device, demonstrating that the experimental set-up was sound and ready for further experimentation.

"In the field of high intensity, people usually quote only a number, but Victor's team went beyond that," says Center for Ultrafast Optical Science Director, Gérard A. Mourou. "This experiment opens up a new era in physics. The field of ultrahigh intensity is now becoming a reality."

The Brave New World of Quantum Computing

Computers based on silicon have followed a remarkable price-performance curve through shrinking the transistors, giving us the computing power of a super-computer of 20 years ago in a microprocessor-based computer which can be purchased for less than one thousandth the cost of the supercomputer. There will, however, be an end to the shrinking of transistors in silicon when silicon technology reaches physical limits. Semiconductor vendors currently predict that this will occur in about 15 years. Researchers at UM and elsewhere are exploring the use of quantum phenomena which might lead to a new generation of computers.

From algorithms for factoring numbers and database searching to theory of the devices themselves, there is a great deal of work that has to be done if a quantum computer is really going to be built.

"The average person may not notice, but underlying systems will be changed because of quantum computing," says Duncan Steel, the Peter S. Fuss Professor of Engineering and director of the Optical Sciences Laboratory. Steel's research group is working on developing the devices that would actually work in a quantum computer.

Classical computer devices work with the numbers 0 or 1, one at a time, but devices that would work in a quantum computer need to work with both numbers — 0 and 1 — simultaneously. This leads to what appears to be a massive parallelism for computation. In quantum computers, these numbers are stored in qubits. In a quantum computer, n-qubits can compute with all 2n numbers simultaneously. Qubits based on atoms are being investigated by a group at the National Institute of Standards and Technology (NIST) and at Michigan in the Physics Department by Chris Monroe.

"Quantum computing research is very futuristic and will have a tremendous impact."

Atom-based systems will probably form the first successful quantum computer. However, the semiconductor quantum dot system of the type being investigated in Steel's laboratory will probably be the more advanced "Pentium" version. Both systems have successfully shown that they can manipulate and read out a single qubit.

Steel says, "Progress in the area of quantum computing has been faster than people expected" but, not surprisingly, the problems are at least as big as people thought they would be.

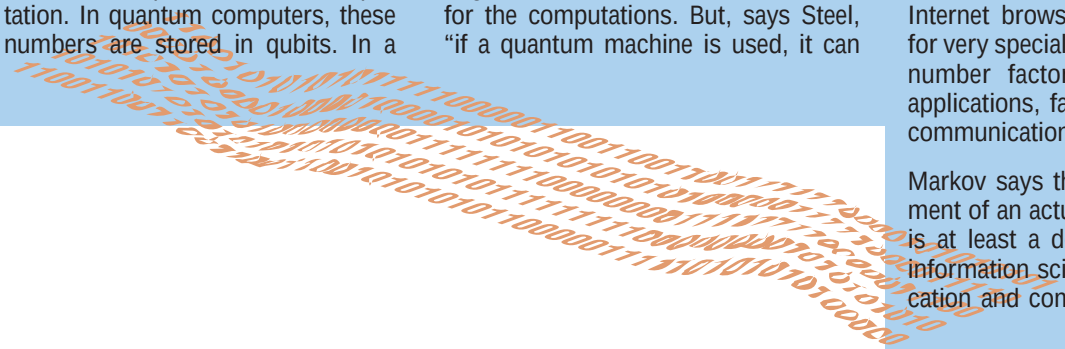
"The most famous problem is the problem of being able to factor numbers," says Steel. Factoring affects Internet security, communications, and national security issues such as encryption. Encrypted numbers are getting bigger and bigger. The bigger the number, the larger the machine that will be needed for the computations. But, says Steel, "if a quantum machine is used, it can factor larger numbers but still remain small in size."

Most known algorithms are no better if implemented on a quantum computer. So far, two useable quantum algorithms have been found — factoring and database search. EECS professors Igor Markov and John Hayes are working on additional quantum algorithms and techniques to design quantum circuits. The Defense Advanced Research Projects Agency (DARPA) is funding Markov and Hayes and their Quantum Circuits Group for a three-year period, in which the researchers are synthesizing, simulating, and testing conventional and quantum logic circuits in order to obtain a deeper understanding of both areas. In addition to quantum computing, quantum logic circuits are useful for secure communication.

"In quantum mechanics," Markov says, "the signal is destroyed upon reading after you send it through a quantum channel. Therefore, if someone tries to intercept your password, you are not going to receive anything and may become suspicious. By sending messages piecemeal and confirming the receipt of every piece, this can be amplified to physically secure communication that does not rely on difficult computational problems such as number factoring."

"There is a common misconception that quantum computing will replace the classical computer, but that seems unlikely to me," says Markov. "It is not for word processing or Internet browsing, for example, but for very specialized problems such as number factoring in cryptography applications, fast search, and secure communication."

Markov says that while the development of an actual quantum computer is at least a decade away, quantum information science is close to application and commercial use. A Swiss



company, IdQuantique (www.idquantique.com), is marketing quantum communications devices to banks, and a U.S. firm, MagiQ Technologies, (www.magiqtech.com) offers commercial quantum cryptography.

But researchers realize that they must not regard quantum computing as a salve for all classical computing shortcomings. It is important to investigate what quantum computers cannot do. This kind of theoretical limit is where EECS Professor Yaoyun Shi comes in. While he was a student at Princeton, Shi and his colleagues discovered that quantum computers do not have much advantage over conventional computers in sorting unordered lists.

"It's important to understand the computational power of quantum mechanics, to focus not only on what it can do but also on what it cannot do," says Shi. "What it cannot do is also vital to the design of cryptosystems that are immune to quantum attacks." As a new EECS faculty member, Shi continues his theoretical work here, expanding his research to classical simulations of quantum algorithms, quantum communications, and other areas. Shi says, "We know quantum computers can be more efficient in terms of running time, but what about space? Can we make them faster while using less space, or will we need to do a time/space tradeoff? And how can we minimize the amount of communications entailed by exchanging quantum information?"

Shi agrees that while the impact on everyday life may not seem apparent, everyone will be touched by this work. "For example, quantum computers may be used to design the quantum devices that make up the classical logic gates of the future desktops," says Shi, "Or, future computers may be embedded with a 'quantum chip' that deals with some special calculations or performs secure communications."

"Quantum computing research is very futuristic and will have a tremendous impact," Shi says. "The first digital computer was created in the 1940s, but the theory of computers was developed during the 1930s. This is the kind of timeline we're looking at. Now is the time to lay the groundwork for the incredible possibilities of quantum computing. And it's up to the theoreticians to find the enormous applications of it. I like doing this work because it is so fundamental."

Complementary research in other areas will contribute to the future of quantum computing. "In order to be able to produce the types of scalable architectures that have been envisioned in the laboratory, we need advances in materials research," Steel says. Already, advances are being made in the fabrication of semiconductor quantum dot arrays and architectures, in single electron doping, and with integrated ultrafast optics, that are very encouraging.

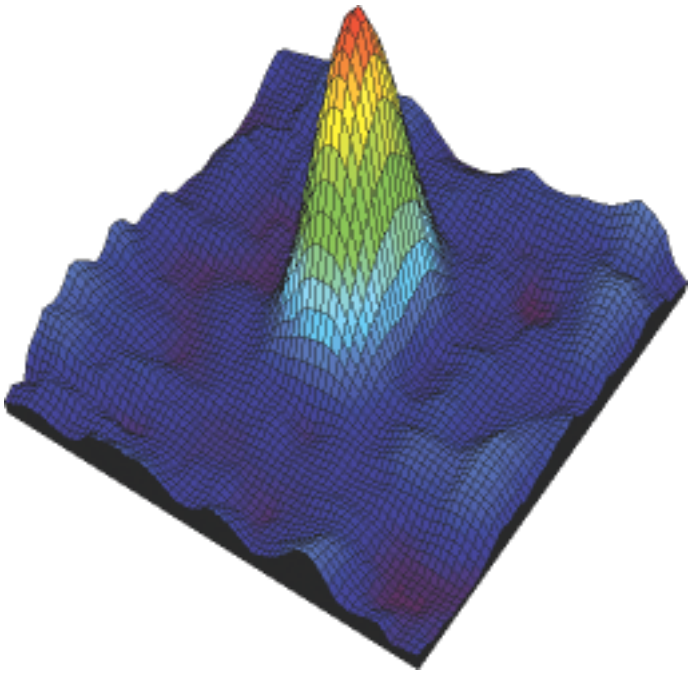


Image of a quantum bit of information obtained from a near-field optical scanning microscope. The information is stored in a 2-micron by 2-micron quantum dot, called a qubit, grown in GaAs material. When light hits the dot, it creates an electron-hole pair called an exciton. In the binary code, the absence of an exciton is a zero and the presence of an exciton is a one. This image, taken at 4 degrees Kelvin, shows the spatial extent of the wave function of the exciton and reflects the fact that the dot is in the one state. If the dot were in the zero state, the image would be spatially flat. The image is 2 microns by 2 microns [1 micron = 1 millionth of a meter].

Solar Car Team

Solar Car Runs the SpectruM of Success

"I would say 50% of the Solar Car project is electrical, 50% is mechanical/aero, and another 100% is hard work!" says faculty advisor Brian Gilchrist.

As professor of Electrical Engineering and Computer Science, Gilchrist oversees EECS student work from an informed perspective. "EECS students have been involved in every race," says Gilchrist. "As time has gone on, the sophistication of the electrical systems has increased. However, so have most other technical areas. It is truly an interdisciplinary effort."

The 2003 Solar Car Team and SpectruM

The team is getting the newest Solar Car, SpectruM, ready for the 2003 American Solar Challenge. This is the longest solar car race — 2300 miles from Chicago, Illinois, to Claremont, California — and is open to competitors around the world.

Students Learn on the Road

UM's 2001 student race team won the race with the car M-Pulse. M-Pulse had a record-setting time of 56 hours, 10 minutes, and 46 seconds, and an average speed of 41 miles per hour while mostly traveling along the historic (and now sometimes quite bumpy) Route 66. The speed is hardly Indy 500 material, but it is phenomenal when one considers that this is a project built by hand, from the electrical work to the body, and powered exclusively by solar energy.

"This year's car builds on what we learned, creating an even better race vehicle," race crew operations leader Nicholas R. Schoeps says. "We absolutely have an excellent chance at winning this race." Schoeps is an Industrial Engineering and Mechanical Engineering major who, as a freshman, says he considers himself lucky to be a part of the race crew.

"Personally, the Solar Car project is invaluable to me," says Schoeps. "I've learned to use a mill, weld, and lay up carbon fiber. You learn about composite materials and racing components. You learn how to manage a race budget, how to be a leader, how to be a teammate, how to be a teacher. It's all the little things they can't teach you in the classroom."

EECS student Adam Sloan agrees. "In class, you never think about how much something costs or how hard it will be to get or make a product," says Sloan, who manages some of the electrical activities. "I've also learned a lot about making a reliable system. The car is a very rough environment that's definitely different from the test bench."

While EECS majors are forced to think about vibrations and high temperatures and limited space, making a system redundant and easily fixable also becomes important. "Connectors become a big issue and fusing things is crucial. So is making sure that all of your connections are solid the first time so that you won't have to go through and find the problem when time is short," he says. "Attention to detail has become a big thing in this project, and I've learned that the little things really make a difference."

Alumni Involvement

"I ended up becoming one of the team's enthusiastic supporters," alumnus Leslie McDermott (BSEE '76) says. McDermott was working for IBM when the corporation asked him to evaluate the first team's potential for funding in 1990. He said, "The most amazing thing was that students from every possible college and discipline were organized and participating in the project. Each team had a documented mission, plan, and schedule."

McDermott's evaluation concluded that the only things the Solar Car project lacked were physical resources and experience. IBM contributed surplus personal computers and encouraged employees to donate their business and personal time to the project. McDermott says that corporate involvement in the project boosted employee morale, and information about how products could be used proved valuable to IBM's transportation systems groups.

> **"You learn how to be a leader, how to be a teammate, how to be a teacher."**

Alumnus Chuck Hutchins (BSE ME '57) has been a supporter from the beginning. "The requirements to build a winning entry are diverse and very real-world. That realization was what really hooked me," Hutchins says. "The car must travel the prescribed route in the shortest time to be the winner. As we found out in 1995 and 1999, any failure puts you out of the winner's circle." Hutchins says that there are few student projects that provide as much realism and breadth of experience.

Winning the Race

"Extracurricular projects like the solar car team are what makes going to a place like the University of Michigan an experience," says Nick Schoeps. He asks, "In what industry do you have general meetings where anyone can hear or contribute to the entire project? This is a million-dollar project. You can do anything you want in this project, and you learn more than you ever will in any class. It's great because it's a passion. It's about making things happen, putting a car on the ground, winning the race. And we love it."

www.engin.umich.edu/solarcar

Student Awards

DAC/ISSCC Student Design Contest — 2002 and 2003 Wins

UM took first and second place awards in the 2003 DAC/ISSCC Student Design Contest — and first place in the 2002 competition.

The 2003 first-place team consisted of students Robert M. Senger, Eric D. Marsman, Michael S. McCorquodale, Fadi H. Gebara, Keith L. Kraver, and Matthew Guthaus. They designed a 16-bit mixed-signal microsystem with integrated CMOS-MEMS clock reference. Second place was secured by the team of students Masoud Agah, Yang Li, and Robert M. Senger; they designed an integrated thermally-based microflow sensor.

The 2002 first-place team consisted of doctoral candidates Steven M. Martin and Roy H. Olsson, III. They also took the prize for best overall paper, "A Microsystem for Near-Patient Accelerated Clotting Time Blood Tests."

UM Wins USF International Business Plan Competition

Mobius Microsystems won first place. More than 80 teams entered the competition. Michael S. McCorquodale, PhD student in EECS, and his team received $1,000 for Best Pitch and $10,000 for Best Overall Business Concept. Next, Mobius will participate in the MBA Jungle Business Plan Competition in New York. McCorquodale also received the 2003 Harry Benford Award for Entrepreneurial Leadership and the 2002 EECS Distinguished Achievement Award.

International Thesis Prize Competition

Nam Sung Kim, a candidate for the PhD in VLSI, received a silver medal and $5,000 in the Humantech Thesis Prize Competition awarded by Samsung Electronics. The title of his thesis is "Reducing Register Ports Using Delayed Write-back Queue and Operand Pre-Fetch." The prize is in its eighth year, and winners were selected from among 633 entries from more than 60 institutions around the world. Nam's advisor is Trevor Mudge.

International VLSI Design Contest

Jay Sivagnaname and Rahul Rao, graduate students in EE, took first prize for their entry, "Dual Issue Power-PC FXU Processor," at The 16th International Conference on VLSI Design (VLSI DESIGN 2003), held in New Delhi, India. The contest encourages education and research in state-of-the-art VLSI design.

Sun Microsystems and TopCoder Programming Competition

CSE graduate student Tom Sirgedas won a total of $6,000 in the Sun Microsystems and TopCoder Collegiate Challenge Programming Competition, and was named Midwest Champion.

2002 UM Outstanding Graduate Student Instructor Award

Eric Marsman (BSE EE '00, MSE EE '01) was one of only 20 UM graduate student instructors to receive the 2002 award. Recipients demonstrate "exceptional ability, creativity, and continuous growth as teachers" and provide outstanding service as a mentor and advisor to students and colleagues. Marsman taught EECS 427, VLSI Design I. Marsman is also a past recipient of an American Society for Engineering Education (ASEE) Outstanding Student Instructor Award.

World's Smartest Person Competition

Andrew Nierman, Ph.D. candidate in Computer Science under Professor H. V. Jagadish, won the International High IQ Society's World's Smartest Person competition. He received $500, a T-shirt, and a plaque. Nierman scored higher than the 100,000 other people who took the test, answering 22 of 25 questions correctly, including two questions that have yet to be solved by anyone else. Nierman is taking such acclaim in good stride, saying, "Winning the contest was kind of a mixed blessing. I had a lot of phone calls and requests for interviews that I would have rather not had to deal with. But on the other hand, solving the problems and trying to move up the contest 'leaderboard' was fun."

International Conference on Computer Aided Design

Graduate students Matt Guthaus (BSE CE '98, MSE EE '00) and DoRon Motter won the ACM SIGDA CAD contest at the International Conference on Computer-Aided Design (ICCAD) and received $1,000 each. Fifteen teams of two PhD students each from UM, MIT, Berkeley, USC, CMU, UT-Austin, Wisconsin, and others were given a Linux box, a C compiler, and some standard libraries to use in solving a set of CAD-related problems. The competition tested CAD knowledge and problem-solving, programming, and teamwork skills.

2002 Alumni Society Merit Awards Recipients

Computer Science and Engineering Division

Kevin O'Connor (BSE EE '83)
Chairman, DoubleClick Inc.
As co-founder, Kevin O'Connor has grown DoubleClick from two people working in a basement to a global corporation that employs almost 1,200 people. He oversees new market development, long-term strategic direction, and the overall vision of the digital marketing solutions company. Before founding DoubleClick in 1996, he co-founded the Internet Advertising Network (IAN). The software technology pioneered by IAN paved the way for the creation of DoubleClick and the first full-service Web advertising network.

A memorable time studying at EECS: *This is something no student can relate to these days, but back when I was in school, we interfaced with the computer system via punch cards or teletype machines. The teletypes were so hard to come by and the lines were long. There was one incredibly old, secret teletype machine, though, located in some closet in West Engineering. I think it was 300 baud and was louder than a jet engine. Man, did I hate computers back then.*

Electrical and Computer Engineering Division

Rob A. Rutenbar (MSE '79, PhD '84)
Stephen J. Jatras Professor of Electrical and Computer Engineering, Carnegie Mellon University and Director, Center for Circuits, Systems, and Software
After graduating from UM, Rob A. Rutenbar joined the faculty of Carnegie Mellon University. His research interests focus on circuit and layout synthesis algorithms for mixed-signal ASICs for high-speed digital systems and for FPGAs. In 1987, he received a National Science Foundation Presidential Young Investigator Award. From 1992 to 1995, he was a member of IEEE Spectrum's Editorial Board. Rob Rutenbar is a cofounder of NeoLinear, Inc., a startup company delivering CAD solutions for custom analog integrated circuit design, and an IEEE Fellow.

Dean Stephen Director, Kevin O'Connor, John Laird (Assoc. Chair, CSE Division)

Dean Stephen Director, Rob Rutenbar, Richard B. Brown (Interim Chair, EECS)

Engineering Alumni Society Awards

2002 Alumni Society Recent Engineering Graduate Award Recipient

Larry Page (BSE CE '95), Co-Founder and President, Products, Google Inc.
After graduating from UM, Larry Page went to Stanford to pursue his PhD. There, he teamed up with fellow doctoral student Sergey Brin to create the Internet search engine, Google. Based on its PageRank algorithm, Google brought a new level of speed and accuracy to information retrieval on the Internet.

As Google's founding CEO, Page grew the company to 200 employees and profitability before moving into his current role as president, Products. He continues to share responsibility for Google's day-to-day operations with its current CEO, Eric Schmidt, and co-founder Brin.

An East Lansing native, Page's father was a professor of computer science at Michigan State University. At UM, Larry Page received many leadership awards, and served as president of the Eta Kappa Nu honor society. He built a programmable plotter and inkjet printer out of Legos.

In 2002, *MIT Technology Review* magazine named Larry Page a Young Innovator Who Will Create the Future, and a World Economic Forum Global Leader for Tomorrow.

Alumni Notes

The 1950s

Thomas F. Hauck (BSE EE '51) is enjoying life. His work record includes: two years at Lockheed Burbank; two years at the U.S. Air Force, Washington, D.C.; 37 years as systems/project engineer at Lear Inc./Smith Industries; and now 10 years as an education/sports aide volunteer. He has been married to his wife, Donna, for 44 years. They have two children and three grandchildren.

Phillip A. Sandford (BSE EE '50) has been "having a ball" trying to establish a few acres of prairie land, woodland, and wetland wildflowers with fruit orchards and gardens at his retirement home in northern Illinois. He began this new venture upon retiring in 1992 after a 40-year career in electronic and electromechanical engineering of consumer, space, and industrial products; thermoelectrics; automated cooking; computerized cash registers; and consulting. He worked for GE, Borg-Warner, Philco-Ford Division of Ford Motor, Northern Electric, McDonald's Corporation, Sandford Associates, and Sunbeam Corporation. He said he invented the "world's safest and most comfortable electric blanket concept." He is married and has five children and six grandchildren, and is a master gardener for the University of Illinois Extension Service.

The 1970s

Jack Bonn (BSE ECE, '76; MSE CI&CE, '77) has been an independent consultant since 1979. He has worked on everything from radars to sonars to bottle-making machines. He has recently become involved in the production of liquid handling equipment in support of drug discovery and genomic/proteomic research. He has been married since 1977 and has two children.

Robert W. Bossemeyer (MSE EE, '78) writes, "In 2000, after almost 19 years in applied research at AT&T Bell Laboratories and Ameritech Science and Technology, I started my own consulting business, Speech Technology Applied Research, Inc., in St. Charles, IL." He provides consulting services in text-to-speech and speaker verification technologies. He also is speech biometrics team leader for Quantum Signal, LLC, an Ann Arbor company co-founded by Professor William Williams and Dr. Mitch Rohde, a UM Bioengineering Program graduate. "It's nice to be working with Bill again; he was my thesis advisor (and mentor) when I was an undergraduate and graduate student during the 1970s."

F. G. Gray (PhD CI&CE, '71) will retire on June 1, 2003, after 32 years of service to Virginia Tech.

Robert Isackson (BS EE '78) graduated from UM Law School in 1982; moved to New York to practice patent law at Fish & Neave; joined the Davis Hoxie patent boutique in 1991 and made partner; helped merge Davis Hoxie into Orrick in 1995; and is now head of the New York IP group. His legal practice is mostly patent litigation for Fortune 100 companies in a wide variety of technologies including medical devices, genetically modified DNA in crop biotechnology, software, pharmaceuticals, and computer-controlled deep fat fryers, to name a few. He has been married since 1984; has one daughter, born 1989, and one son, born 1993; and resides in Tenafly, NJ.

Walter L. Whipple (MSE, '74; and PhD CICE, '88) writes: "A little over four years ago, I re-planned my career and changed to contract engineering work. Clients have included United Parcel Service, American Buildings, Tellabs, Microsoft, and Boeing. Currently, I'm writing test procedures and other documents for special test equipment used for communications satellites at Boeing Satellite Systems. My wife, Jean, also left direct employment for document management software consulting. We have two daughters, Kate and Sara, and two grandsons, Bryan and John. We've settled in Goleta (suburb of Santa Barbara), CA, to be with the kids and a cousin."

The 1980s

Mark R. Brown (MS CI&CE, '80) graduated with honors from Rutgers School of Law (Newark) in May 2002, and was inducted into the Order of the Coif Law Honors Society. He recently passed the registration examination for patent agents given by the U.S. Patent and Trademark Office. His work focuses on traffic flow measurements for IP networks and reachability monitoring for MPLS-based virtual private networks.

Alumni Facts

13,850 EECS Alumni

Top Five EECS Alumni States

• Michigan	4,318
• California	2,282
• Illinois	549
• Texas	544
• New York	425

New EECS Alumni Society

Homecoming Weekend in October 2002 was the scene of many happy reunions — and the birth of the new EECS Alumni Society. EECS alumni and friends answered Interim Chair Richard B. Brown's invitation to discuss the formation of this group. As a result of that meeting, EECS Alumni Society bylaws were adopted and officers were elected.

EECS Alumni Society President Bill Becher (MS EE '61, PhD EE '68) is excited about the new organization which, he says, "will foster mutual social and intellectual benefits among our alumni, students, faculty, and friends; camaraderie within the membership; and benefits to the entire EECS and Engineering community."

The alumni society plans to get students involved before they graduate. "We hope this will influence students' continual interest in the Society after graduation," says Becher. "It also will help make the Society aware of the needs of students, and help us focus our support on those needs." Becher and the other Society officers foresee a mentoring program and career assistance for students. "The membership can benefit, too, by identifying future employees for their organizations," Becher says.

Future activities include honoring fellow alumni, getting together at a tailgate party during Homecoming Weekend, linking the faculty and alumni together so they might share common interests, and more. Becher says, "We're also thinking of offering departmental tours and special lectures during Homecoming Weekend so our alumni can see all the great things our department has been, and is, doing."

www.eecs.umich.edu/eecs/alumnisociety

David Edwards (BS CE, '84) became a supervisor at Yazaki North America, Canton, MI, where he has worked since 1998. From 1995 to 1998, he was a software application developer at EDS, and from 1985 to 1994, he was a logic designer at IBM.

David J. Gaskey (BSE EE, '89) and **John E. Carlson ('91)** are partners at the intellectual property law firm of Carlson, Gaskey & Olds, P.C. (CGO) in Birmingham, MI. CGO was founded in July 2000 and has grown to 10 patent attorneys. CGO recently was named by its Fortune 250 clients as their principal intellectual property counsel in "Who Protects IP America," *The Year in Intellectual Property Almanac 2002*.

Kenneth F. Gudan (BSE CE, '85) works for Apple Computer in Cupertino, CA. He is a lead EE for the iMac desktop product line, having a direct design/development contribution to every iMac to date. This job has taken Ken to Asia and Mexico numerous times for factory visits (and stress!). He writes, "I have been blessed to be married to Vivian for 11 years, with son Paul (six) and daughter Lisa (four), and we reside in Sunnyvale. Feel free to e-mail a hello if you wish to gudan@apple.com!"

Kenneth W. Hawk (BSE EE, '86) started 1-800-Batteries in 1993 after graduating from the Stanford MBA program. He took the company public as iGo in 1999 and recently sold iGo to another public company. He recently took over as CEO of NemeriX in Lugano, Switzerland; they are a fabless semiconductor company that makes low-power GPS chipsets. Ken traveled to the annual Hannekamen ski race in Kitzbuhel where he had a terrific dinner with Arnold Schwartzenegger, "whom I met through my close friend, Franz Weber, world record-holder for speed skiing."

Anthony Lavdas (BSE EE, '87) is working on the development and deployment of next-generation Electrical CAD/CAE/CAM/PIM tools for Ford Motor Company Advanced Vehicle Technologies. He is the EESE C3P Method Lead Section Supervisor, EESE MCAD Development and Deployment.

Jae Hong Lee (PhD EE, '86) is the general chair of the 57th IEEE VTC (Vehicular Technology Conference) Spring 2003 in Jeju, Korea, April 22-25, 2003. He is a professor of electrical engineering at Seoul National University, Seoul, Korea. He also serves as the director of the Institute of New Media and Communications of Seoul National University.

Robert V. Nightingale (BSE EE, '86) said that his "Great Accomplishment" in this economy means he's done enough to keep his job! In the last five years at JDA Software, he has been involved in designing and implementing decision support databases with Oracle, a job that has sent him to Australia, Europe, South America, South Africa, Canada, and all across the U.S. When it's warm, he enjoys the beaches along Lake Michigan.

Scott K. Riggs (BSE CE, '86) is vice president, Information Technology, for ProQuest Company in Ann Arbor, a digital archiver and publisher to the education and library markets throughout the world. He enjoys cooking, wine, and golf (when time permits).

Aviel D. Rubin (BS Cpt & Com Sc, '89; MSE CSE, '91; PhD CSE, '94) recently moved to Johns Hopkins (from AT&T Labs), where he is an associate professor and the technical director of the new Information Security Institute.

Steven R. Schwartz (BS CE, '89) co-founded Inovo Technologies, an Ann Arbor-based consulting firm focused on commercial innovation in January 2003. Inovo's helps companies create economic value from new technologies — or acquire the technologies to provide a commercial edge in existing markets. Inovo's Web site is www.inovotech.com.

The 1990s

Paul L. Bergstrom (PhD EE, '96) joined the faculty at Michigan Tech's Electrical and Computer Engineering Department, where he has been building a research program in MEMS materials and process integration technologies for integrated sensors. He participates in the NSF Engineering Research Center on Wireless Integrated Microsystems with UM and MSU, and cultivates industrial interactions on integrated sensing technologies. He and his wife, Maria, enjoy the north woods with their three children, two girls (ages six and one) and a boy (four). (See ERC/WIMS article on page 11.)

David S. Carter (BSE EE, '93) was appointed engineering librarian at the University of Michigan Media Union Library in September 2002. He was previously the director of the Internet Public Library (IPL) and a lecturer at the University of Michigan's School of Information, where he taught classes on digital librarianship and on information resources in the sciences. He has worked with the Alliance for Community Technology (ACT) and librarians with the American Indian Higher Education Council (AIHEC) in setting up an AIHEC Virtual Library.

Krishnendu Chakrabarty (PhD CSE, '95) was promoted to associate professor with tenure at Duke University in 2002. He was awarded the National Science Foundation Career award in 1999 and the Office of Naval Research (ONR) Young Investigator award in 2001. He is married to Kamalika Mukherjee and has one son.

John C. Cowl (PhD EE, '94) is a design engineer at Analog Devices in Beaverton, OR, where he is responsible for RF/IF product design. He is married to Mary Ulmer, and they have a daughter, Sophia. John's brother, Bob Cowles, is a surgery resident at the UM Hospital. John enjoys world traveling, history, and anthropology. He speaks Portuguese, Spanish, French, German, and Russian. He stays active with soccer and tennis, and says that time constraints forced him to get into jogging, cycling, weights, and swimming.

Jennifer Crowley (BSE EE, '95) is president and owner of Cross Consulting and Sales, L.L.C. She received an MBA from Northwestern University. After working several years at Texas Instruments in semiconductor marketing, technical sales, and business development roles, she started a business consulting and sales representative firm specializing in strategic marketing and sales for technology-based companies. She has traveled extensively for both work and pleasure. A highlight of last year was a backcountry trek in Alaska. She lives in Michigan and makes it back to UM for almost every home football game.

Marco D'Aristotile (BS CE, '99) is employed at the EDS Virtual Reality (VR) Center in Troy, MI. He is engaged in many projects involving high-end VR hardware, VR facility design, and 3-D content creation. Clients have included major auto manufacturers, the military, architecture firms, city governments, and many others.

Eric A. Durant (MSE, '99; PhD, EE-Systems, '02) joined Milwaukee School of Engineering as an assistant professor in the Department of Electrical Engineering and Computer Science in March 2002.

Gordon Good (BS CE, '91) is co-author of the book, *Understanding and Deploying LDAP Directory Services*, published this year by Addison-Wesley Professional. Co-authors are EECS alumni **Timothy A.**

Alumni? Alumnae? What does it all mean?

You say "alumni." Your spouse says "alumnus." Do you ever feel like calling the whole thing off? Here is a short but sweet definition of terms:

- Alumni —(Plural) A group of people who graduated from the same school, college, or university. "Our 13,850 alumni are the best in the world."
- Alumnus —(Singular) A male graduate of a school, college, or university. "Larry Page is a UM alumnus."
- Alumna —(Singular) A female graduate of a school, college, or university. "We are proud to say that Sheila Hemami is an EECS alumna."
- Alumnae —(Plural) A group of women graduates of a school, college, or university. "CSAM is comprised of Computer Science alumnae."

Howes (1996: PhD, CSE) and **Mark C. Smith (1988: BSE, CE)**. Good is a senior software engineer at Opsware, Inc., in Sunnyvale, California.

Andrew P. Hoover (MSE EE, '93) is an IC design engineer at Motorola, in the Semiconductor Products Sector. He is married and has three children, ages two, five, and seven. Andrew is actively involved in world hunger relief efforts via CROPWALK and is involved with the Texas Legislature to promote family-friendly legislation.

James K. Huggins (PhD CSE, '95) was promoted in July 2002 to associate professor with tenure of Computer Science at Kettering University, where he received a Kettering University Alumni Association Outstanding Teaching Award in June. He is married to Jane E. Huggins and has a daughter, Clara, born in 2001.

Christy L. Johnson (PhD EE, '90) is an advisory engineer/scientist in the Surface and Materials Science Laboratory at IBM Corporation in Vermont. She is involved in transmission electron microscopy.

William F. Kolakowski (BSE CE, '93) was elevated to membership in the law firm Dykema Gossett PLLC where he specializes in intellectual property law, including patents, trademarks, copyrights, and related litigation. He is a registered patent attorney with a concentration in computer, electrical and electro-mechanical technologies.

David P. Trumpy (BSE EE, '99) works on a digital signal processing system for machinery vibration monitoring for the XM product line for Rockwell Automation. The system won some prestigious awards, including the Industry Week Technology of the Year and Control Engineering 2002 Editors Choice Award. Click on www.entek.com.

Khurt L. Williams (MSE EE-Systems, '94) started his own IT consulting company in Princeton, NJ, in January 2000. He is married (1996) with a son (Shaan, almost four), and daughter (Kiran, two).

The 2000s

Egor Alekseev (PhD EE '00) a senior design engineer at MCE Inmet, Ann Arbor, MI, is delighted to announce the birth of his baby daughter, Tess Elisabeth, born March 2, 2002.

Laura N. Hamel (nee Carter) (BSE CE '00, MSE CSE '01) writes that, "Two EECS geeks tied the knot." Andrew Hamel (MSE expected April 2003) and Laura Carter (MSE, '01) met as EECS undergraduates and were married on August 17, 2002. They live in Ann Arbor.

Alpesh Jain (MS EE, '00) is a component design engineer in the Wireless Computing and Communications Group at Intel Corporation, Austin, TX. Alpesh writes, "Austin doesn't have a UM Alumni Association chapter, and I would love to get together with other Wolverines in town, to start one. So, if you are one, drop me a line ASAP!! Go Blue!!" Write to Alpesh at alpeshjain@yahoo.com.

EECS Alumni Around the World

More than 800 of our EECS Alumni live in more than 60 countries around the world, including:

Algeria
Argentina
Australia
Azerbaijan
Bahamas
Bahrain
Bangladesh
Belgium
Brazil
Canada
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New Zealand
Nigeria
North Korea
Norway
Pakistan
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In Memoriam

'23	Joseph F. Kruszka (BSE EE), 5/8/02
'25	Francis A. Miller (BSE EE), 1/17/02
'29	Arthur J. Beck, Jr. (BSE EE), 1/2/02
'30	Stanley W. Zimmerman (BSE EE, MSE), 5/13/02
'38	Donnan H. Basler (BSE EE), 2/23/02
'41, '70	Rowland H. McLaughlin (BSE EE, CI & CE), 5/5/02
'41, '53	Nelson W. Spencer (BSE EE, MSE), 8/31/02
'43	John W. Duff (BSE EE), 4/10/02
'43	Richard K. Mosher (BSE EE), 8/12/02
'44	Walter N. Berlin (BSE EE), 6/22/02
'46	Wayne D. Bartlett (BSE EE), 6/9/02
'48	Gordon T. Park (BSE EE), 1/26/02
'48	Willys W. McCloud (MSE), 9/2/02
'49	Gordon R. Lawrence (BSE EE), 6/11/02
'50	Alfred J. Magyar (BSE EE), 12/5/02
'50	Jack William Sarver (BSE EE), 10/4/02
'50	Harold W. Sherman (BSE EE), 2/25/02
'51, '52, '55	Joseph E. Rowe (BSE EE, MSE, PhD), 10/23/02
'52	Robert John Hansen (BSE EE), 1/9/02
'58	Howard A. Agosta (BSE EE), 6/6/02
'59	Francis L. Carr (BSE EE), 7/25/02
'64	Lt. Col. Eugene H. Fox (BSE EE), 5/20/02
'66	Joseph Krieger (BSE EE), 3/9/02
'68	Richard L. Carson (BSE EE), 5/11/02
'82	Thomas M. Sharpe (BSE EE), 9/9/02
'85	David P. Himlin (BSE EE), 6/9/02

Dr. Joseph E. Rowe (BSE EE/Math '51, MSE '52, PhD EE '55)

Joseph Everett Rowe, former faculty member and Chair of EECS, passed away October 23, 2002, at the age of 75.

Dr. Rowe joined the University of Michigan faculty in 1953. He became Director of the Electron Physics Laboratory in 1958, a position he held for ten years until he was named Chair of EECS. Under his leadership, the Electron Physics Laboratory became one of the premier laboratories on campus and was the forerunner of the Solid-State Electronics Laboratory.

Dr. Rowe left the University of Michigan in 1974 to become Dean of Engineering and then Provost of Case Western Reserve University. He went on to industry, where he held several positions as vice president at Harris, Gould; Pittsburgh Plate Glass (PPG); and the Dayton Research Institute, before founding his own company, Rowe Associates, Inc.

Prof. Rowe was a first-rate scientist who made significant technical contributions, a great visionary, and an astute businessman. He was one of the major pioneers in the area of microwave devices and, in particular, vacuum tube devices such as traveling wave tubes and magnetrons, which are still in wide use today in many applications, including high-power communication and radar systems as well as microwave ovens. His 1965 book, *Nonlinear Electron Wave Interaction Phenomena*, is a standard in the field.

Dr. Rowe received a University Distinguished Faculty Achievement Award, was a member of the National Academy of Engineering, and was a Fellow of the Institute of Electrical and Electronic Engineers.

He was a member of the College of Engineering's National Advisory Committee, Chair of the Annual Fund, and a member of the executive committee of the Design for Impact Campaign. In recognition of his many accomplishments and service to the Department and College, he received the first College of Engineering Alumni Society Merit Award for EECS in 1992.

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