ELECTRICAL AND COMPUTER ENGINEERING

COMMUNICATOR

THE UNIVERSITY OF UTAH

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IN THIS ISSUE

Welcome from the Department Chair

Dear Alumni, Friends and Colleagues,

Again, we look back at a very successful year. We were able to hire two new faculty members: Dr. Cameron Charles (RF circuit design) and Dr. Neal Patwari (signal processing), both of which will be complementing our programs in VLSI, signal processing and communications. In addition, the state of Utah has funded the USTAR initiative, which is intended to foster economic growth and technology transfer with a focus on the interface between engineering, biology and medicine. The University of Utah will receive funds for new faculty positions, as well as for a new research building adjacent to the current engineering buildings. The new building will provide dedicated research and development space for researchers and industrial partners, both in the biomedical and engineering domains. The USTAR initiative may support up to two new senior faculty positions in Electrical and Computer Engineering within the coming year. Furthermore, the State of Utah funded again the engineering initiative, designed to increase the number of engineering graduates from the U, and the department is set to receive two faculty positions from this initiative as well. The state's commitment is matched by growing federal and industrial research contracts and grants, including support for novel educational programs in Electrical & Computer Engineering. The future for the department has never before looked so bright at the U.

Cordially yours,
Marc Bodson

ECE Professor Shows Far-Infrared Can be Used for Anti-Terror Devices, Faster Wireless

Modern technology uses many frequencies of electromagnetic radiation for communication, including radio waves, TV signals, microwaves and visible light. Now, a University of Utah study shows how far-infrared light – the last unexploited part of the electromagnetic spectrum – could be harnessed to build much faster wireless communications and to detect concealed explosives and biological weapons.

"We found a way to manipulate a form of infrared radiation that is not now used for communications so that, in the future, it may be possible to use it for high-speed, short-range communication between computers and other devices," says Ajay Nahata, an associate professor of electrical and computer engineering.

The study in the March 29, 2007, issue of the journal *Nature* also shows the feasibility of building devices that emit and detect specific frequencies of far-infrared light – also known as terahertz radiation – to spot chemical or biological warfare agents such as anthrax bacteria and to make images of packages or people to find concealed weapons and plastic explosives, Nahata adds.

The new study was conducted by Nahata and principal author Z. Valy Vardeny, a distinguished professor of physics at the University of Utah, along with Tatsunosuke Matsui, a postdoctoral researcher in physics, and Amit Agrawal, a doctoral student in electrical and computer engineering.

Continued from Page One

To visualize their discovery, imagine shining a flashlight through a kitchen colander, and that holes make up 20 percent of the colander's surface. Only 20 percent of the light will pass through the colander. But when the Utah researchers shined far-infrared radiation through holes punched in a thin steel foil or film, almost all of the radiation passed through the film if the holes were arranged in semi-regular patterns known as "quasicrystal" or "quasicrystal approximates."

(Crystals have repeating patterns over a short distance, such as the ordered pattern of carbon atoms in diamond. Quasicrystals have less structure, but display a pattern over a larger area. Quasicrystal approximates – a term coined by Vardeny and Nahata – also have patterns, but less so than quasicrystals. Crystals, quasicrystals and approximates all can bend or break up light or other electromagnetic waves.)

Until now, such efficient transmission of far-infrared light was achieved only when crystal patterns were used, but unwanted frequencies also were transmitted. In the new study, the researchers could select the wavelength of far-infrared light transmitted through the holes and, by tilting the films, they could switch the transmission on and off.

This shows that high-frequency terahertz signals can be switched on and off to carry data in the digital code of ones and zeroes, and that it someday may be possible to build superfast switches to carry terahertz data at terahertz speeds. That is 1,000 times faster than gigahertz fiber optic lines that carry data as near-infrared and visible light, and 10,000 times faster than microwaves that carry cordless and cell phone conversations.

Talking with Terahertz: An Unexploited Part of the Spectrum

The spectrum of electromagnetic radiation ranges from short to long wavelengths (or from high to low frequency): gamma rays, X-rays, ultraviolet rays, visible light (violet, blue, green, yellow, orange and red), infrared rays (including radiant heat), microwaves, FM radio waves, television, short wave and AM radio.

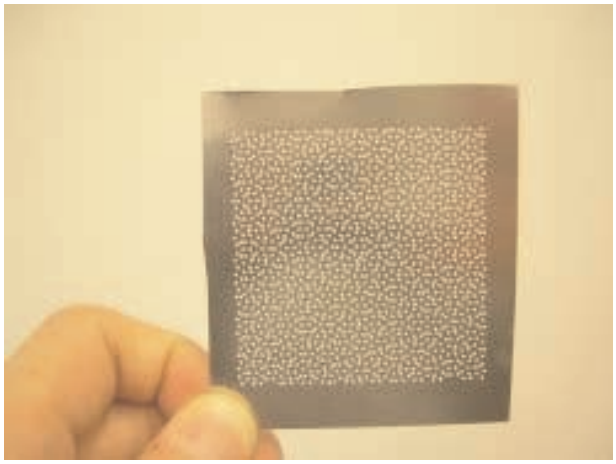
Near-infrared radiation and some visible light now are used for fiber optic phone and data lines. But terahertz or far-infrared radiation – on the spectrum between microwaves and mid-infrared radiation – is not now used for communication.

"Terahertz is a new region of the spectrum for communications" because the rest of the spectrum is crowded with communication and broadcasting signals, says Nahata.

Vardeny adds: "Industry is starving for more electromagnetic frequencies," yet terahertz frequencies are unexplored. They are too high for electronics and there are technical obstacles in generating, manipulating and detecting terahertz radiation.

For electromagnetic radiation to transmit data, the signal must be turned on and off to rapidly create the binary code of ones and zeroes. Modern optical and electronic switches cannot do that fast enough to handle signals with terahertz frequencies (1,000 billion waves per second), but can handle gigahertz signals (1 billion waves per second).

No one has built terahertz switches, but Nahata says the new study shows it is possible to use terahertz radiation to carry data and thus may be possible to create terahertz-speed switches for superfast wireless communication over short distances, such as between a cellular phone and headsets, a wireless mouse and a computer, and a PDA (personal digital assistant) and a computer.



University of Utah researchers have shown it is possible to harness far-infrared light -- also known as terahertz electromagnetic radiation -- for use in superfast wireless communications and to detect concealed explosives and chemical or biological weapons. The researchers shined far-infrared light on metal foils punctured with holes arranged in what are known as quasicrystal and quasicrystal-approximate patterns. Even though the holes make up only a portion of each foil's surface, almost all the radiation passed through the metal foils with these patterns.

NSF Awards $2 Million to College of Engineering for Recruitment and Retention

Utah's Engineers: A Statewide Initiative for Growth

The National Science Foundation has recommended a new $2 million program for student outreach, recruitment, and retention in the University of Utah, College of Engineering. Headed by ECE professor Cynthia Furse, the program provides support in all seven departments in the college. The program follows the Utah Engineering Initiative, where in 2000, Utah's then-Governor Mike Leavitt, challenged Utah's higher education system to double the number of engineering and computer science graduates. Since 2000, engineering and computer science graduates have increased by 46%, and a number of independent recruitment and retention programs have sprung up across the state. This proposed project supports that vision by providing a catalyst to integrate the most successful of these programs via a university/community college/high school partnership that will captivate the imaginations of high school students at an early age, mentor them through a pre-engineering curriculum, and seamlessly transition them through to successful college graduation in their selected engineering discipline. Once entering the university program, this program will help them gain confidence as tutors/mentors, collaborating in curriculum module development and team engineering projects, and participating in service learning community engineering projects. We believe this approach will be favorable to dramatically increasing the number of students, both underrepresented and traditional, in our engineering program. The goal of this project is to establish a sustainable high school/two-year college/University of Utah transition process that will nurture students and increase the number of engineering/computer science graduates at the U of U by at least 180 per year. This accomplishes the UofU portion of the

statewide goal of doubling the number of engineering/CS graduates from 2000 to 2011, but also will substantially increase the number of Utah high school students that select and successfully accomplish college degrees at other institutions in Utah and other states in engineering and other STEM fields. Our goal will be achieved through a student-centered initiative by

- Establishing stronger partnerships between the U of U College of Engineering and potential feeder populations including Academy for Math, Engineering and Science; MESA-STEP; International Baccalaureate programs; Project Lead-the-Way; and Salt Lake Community College.
- Nurturing these partnerships by establishing a "Community Impact" service learning community, which includes classes and interdisciplinary team projects that integrate high school, undergraduate and graduate students in the planning, preparation, and presentation of hands-on modules of real-world engineering experiences. This mentoring/team-based/service-oriented "active learning" community will be effective in attracting high school students to STEM and helping them transition between schools to achieve their four-year degree.
- Fully assessing why Utah students do or don't choose engineering/computer science using a state-of-the-art choice-based market survey to complement our more traditional assessment methods. Applying this assessment to guide us over a five-year program towards best practices that can be implemented for STEM enhancement in other Utah schools and other states.

The vision has been nurtured by a grass-roots team of highly motivated, enthusiastic professors from each of the engineering departments at the University of Utah and evolved into a five-year development plan. Community partners have enthusiastically bought in, including Salt Lake Community College (SLCC, the major feeder to the U of U of transfer students with two years of engineering instruction); the Academy of Math, Engineering and Science (AMES, a charter high school with a priority to prepare underrepresented students for engineering and science careers); Project Lead-the-Way (PLTW, administered through Weber State University, in the early stage of implementing pre-engineering curricula in several school districts in Utah with plans to go state-wide); the Utah Office of Education; the U of U Bennion Center for Service Learning; MESA-STEP; the Colleges of Engineering and Education; and the U of U Vice Presidents for Research and Academic Affairs. All of these bring expertise and independent resources that provide significant leverage for the funding from NSF.

Utah is a rapidly growing state in both population and high-technology industry. With only 1% of the nation's population, Utah is projected to support 13% of the nation's increase in incoming freshmen in the next decade. This program plus the leverage from the programs of our partners will bring more engineers for an expanding industrial base in a fundamental and systematic way that will lead to a sustainable process that will cultivate future engineers/computer scientists at the high school level and smoothly transition them through to their engineering/CS degrees. This program will have broad impact on development of engineers in Utah and a technologically sound basis for transitioning the best practices elsewhere in Utah and other states.

Utah's increasing population will have a measurable impact on the number of engineers in the U.S. Since this program already involves K-12, two-year and four-year schools and will involve transition between multiple schools in Utah, it will already be prepared for transition to schools in other parts of the country. This project integrates a number of best practices into a cohesive state-wide recruitment and retention program. The specific modules developed are unique, and the assessment strategies include a unique market-driven approach.

What Can You Do to Help? We need technical mentors for undergraduate student engineering teams. In addition, we will be developing a number of hands-on activities to take to local schools, and will help facilitate outreach visits. We are also seeking industrial sponsors for several of these outreach modules. To find out more about how you can help, please contact Dr. Cynthia Furse, Electrical and Computer Engineering, cfurse@ece.utah.edu, ph: (801) 585-7234.

Renewal of NIH Contract 2006 and 2007 and Darpa Award for Neuroprosthetics

The contract issued by the National Institutes of Neurological Disorders and Strokes NIH/NINDS to Florian Solzbacher and Reid Harrison was extended after a competitive review of the performance by NINDS officials in Summer 2006. This first option period awarded the team with funding of around $900,000, for one year, to continue research on chronically implantable wireless neural interfaces. In the last week of June 2007, a second option was released, again based on the team performance. In June 2007, Reid Harrison, together with Krishna Shenoy (a partner and subcontractor at Stanford University) carried out the first-ever wireless recordings from cortex using a single chip with a minimum of off-chip components to amplify, digitize, and transmit wideband neural signals.

The team has also been awarded a $25,000 supplement for further material studies and a $100,000 supplement for additional in-vivo studies. A total of ten invention disclosures have been filed as part of the program in the past 24 months. Four provisional patents have been filed and an additional two patents are in preparation.

In synergy with the NIH/NINDS sponsored program, in Spring 2006, Darpa had awarded the University of Utah a $10.3 M contract (PI Gregory Clark, Bioengineering) to develop wireless recording and stimulating interfaces for the use in the peripheral and the central nervous system, as part of a program led by Johns Hopkins University's Applied Physics Laboratory. The contract was awarded in phases, with phase I amounting to $4.8 M, the second phase amounting to $5.5 M. $3.5 M of that sum was awarded as a subcontract in two phases to Florian Solzbacher and Reid Harrison for their work on neural interface developments. Developments are on schedule and we are anticipating presenting the world's first neuroprosthetically controlled arm prosthesis, including more than 30 degrees of freedom of motion as well as sensory feedback, by the end of 2009.

As such, the University of Utah today houses one of the largest and best organized and staffed programs in neuroprosthetics worldwide with more than 12 faculty and laboratories working in or supporting these activities.

Update on NSF Department-Level Curriculum Reform Project: Integrated System-Level Design in Electrical Engineering

In 2005, the ECE Department was awarded a $1 million Department-Level Curriculum Reform grant from the National Science Foundation. Under the direction of ECE professor Cynthia Furse, and with the support and involvement of nearly every professor in the department, this grant has helped to transform our laboratory experiences into system-oriented design projects where each week's lab exercise is a piece of a functional final design. Bryan Stenquist, ECE alumnus, is the Lab Design Engineer on this project. Bryan works with ECE faculty and teaching assistants to design, prototype, and implement each new laboratory. Electrical Engineering students typically receive an excellent education in how transistors, diodes, capacitors, transmission lines, Fourier transforms, amplifiers, filters, lasers, digital circuits, and op amps work. They do a lot of homework that includes design of these individual components, and they experiment with each one individually in a laboratory or two, and compare the measured responses with theory. As each concept is "passed off" on the midterm or final, it can be summarily forgotten by many of our students (who, me?). Only sporadically throughout the curriculum do students have the opportunity to put these disparate ideas together into a system-level design and experiment with how each part impacts the design of the others and the system as a whole. Yet, when they reach the engineering workforce, this is exactly what they are expected to do.

At the University of Utah, we have had a number of very successful experiences with system-level design to improve student understanding, motivation, and capability. Dr. Reid Harrison's Analog IC Design, for instance, remains one of our most popular courses. In this course, the students design, fabricate (via MOSIS), and test an ASIC of their choice. The senior design sequence for the electrical engineering students is also one of the most valuable learning experiences in our program. In this clinic program, industries sponsor groups of five students with a faculty mentor to complete a significant senior capstone design project. This program has now been extended to the computer engineering students in partnership with the School of Computing. Other projects that are part of this project include:

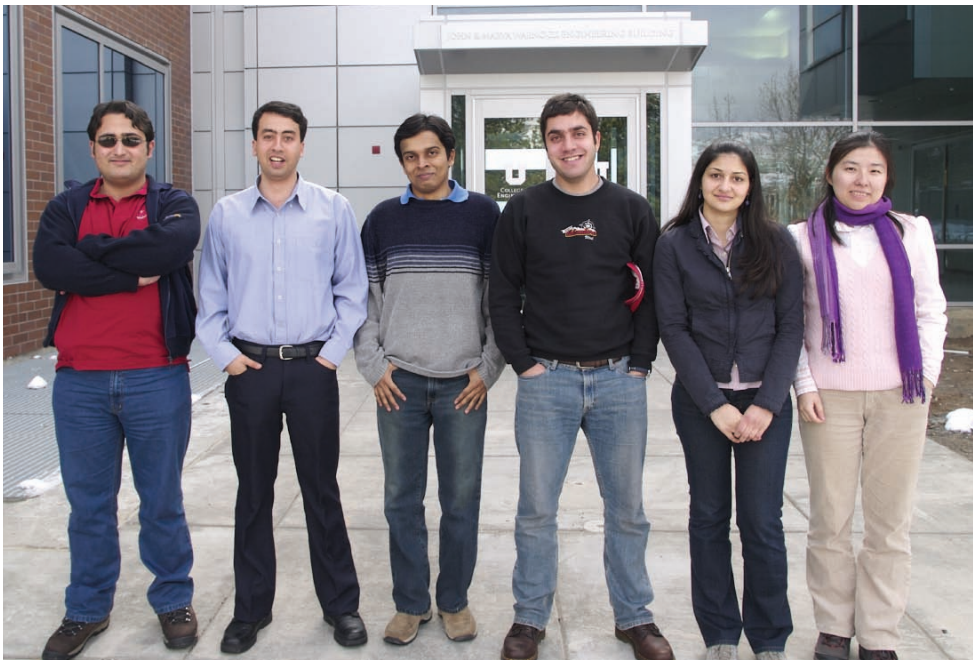
- Cardiac Pacemaker Communication System: This project is designed in ECE 3300 (Introduction to Electromagnetics, Dr. Furse) and ECE 3500 (Signals and Systems, Dr. Farhang). Students build and test a wireless communication system for a cardiac pacemaker. This real-world problem stemmed from NSF-sponsored research projects, and provided an excellent catalyst for student interest, learning, and involvement.
- BioSensor System: ECE 1000 (Introduction to ECE, Dr. Cotter) and BioEng 1000 (Introduction to Bioengineering, Dr. Christensen). Students create a sensor system for physiological monitoring.
- Electromyogram (EMG) amplifier: ECE 3110 (Dr. Harrison) also builds on research by building an EMG amplifier that records electric potentials on the skin produced by underlying muscle activity and drives a speaker so the students can "hear" their own muscle activity.
- In Digital Signal Processing class, students develop a digital communication system based on quadrature amplitude modulation (QAM) signaling. New courses on Software Radio (Dr. Farhang) and Implementation of DSP further enhance the system-level hands-on experience in signals courses.
- Magnetic Levitation Control System: ECE 3510 (Intro to Feedback Systems). Students build a small electromagnetic levitation system and a control system to adjust its resting height.
- Electric Motor Control System: ECE 5570 (Control of Electric Motors, Dr. Bodson) projects have integrated power electronics, electromagnetic modeling, control system design, and real-time computing to provide a multidisciplinary experience for our students.
- In electromagnetics, a multi-course project is underway. In Microwave I, students will build a microstrip FSK wireless local area network receiver. In Microwave II, the transmitter will be built, and in Antennas, the students can design an antenna array to improve the data link. The circuits are further analyzed in the Numerical Methods course.
- Antenna Design: ECE 5324 (Antennas, Dr. Gandhi). Students design, fabricate, and test microstrip antennas.
- In optics courses, the students will do complete systems designs of multiple FTTH implementations along with wireless, cable, DSL, and broadband over power-lines solutions. They will address issues such as performance, scalability, current and future services, engineering cost-tradeoffs, and economic benefits. In subsequent years, we will expand on this project to develop a comprehensive report applicable to any broadband to the home project. We will also link the engineering students with students in economics and business.
- A microfabrication course has been implemented to allow students to prototype, and test devices and systems of their own design.

Several laboratory renovations have been necessary to facilitate these projects. In addition to the renovation of the physical space our laboratories occupy, equipment and capability have been expanded considerably in the past few years. Among the most extensive has been the remodeling and upgrade of the HEDCO Microfabrication Laboratory. The Optics and DSP Teaching Labs have also received significant upgrades. The Microwave Laboratory is currently undergoing upgrade.

We have also been working with the College of Engineering Center for Engineering Leadership (CLEAR) to formally teach and improve written and oral communication skills and team work throughout the curriculum. Each year, two PhD students from the Department of Communication work directly with ECE students to improve lab and final reports, formal and informal presentations, etc. This fits in very well with the project-oriented enhancements to the curriculum, and may be a catalyst for learning that helps students better understand the systems themselves. CLEAR advisors help seniors improve their senior project reports and presentations and meet with undergraduate classes periodically throughout the year. This coming year, ECE will be teaching its own technical writing course in the junior year.

To find out more details about this project, see www.ece.utah.edu/~cfurse/NSF or contact Cynthia Furse (cfurse@ece.utah.edu, (801) 585-7234). Feedback and suggestions from alumni and industrial engineers are very much desired.

ECE Students Named Finalists in Smart Radio Challenge



The Software Defined Radio (SDR) team at the Wireless Communications Laboratory of the University of Utah has been named finalist in the Smart Radio Challenge; a worldwide competition that challenges student teams to design, develop and test an SDR or a cognitive radio (CR) system. The University of Utah team has been selected along with 7 other teams to continue on to the development phase of the project; the challenge originally included 43 student teams from 12 different countries.

The Utah team, two teams from Virginia Tech, and one from Clemson University are going to develop a cognitive radio system for Spectrum Access for the First Responders in the Family Radio Service (FRS) frequency band that can detect available 250 kHz channels in the 5 MHz bandwidth from 462 to 467 MHz.

The Smart Radio Challenge is hosted by the SDR Forum (SDRF) – a nonprofit international industry association that supports the development and deployment of software radio technology for wireless communications systems – and sponsored by The MathWorks, Texas Instruments, Xilinx, Zeligsoft, Objective Interface, Lyrtech, PrismTech, Synplicity, and Green Hills.

The sponsors of the Challenge are donating more than $100,000 worth of hardware and software to the Utah SDR team. The system will be developed on a Texas Instrument/Lyrtech Small Form Factor Software SDR Development Platform that is designed around the latest DSP and FPGA technologies. The Wireless Communications Laboratory has also received a generous $10,000 reward from L-3 Communications-West for advancing in the Challenge.

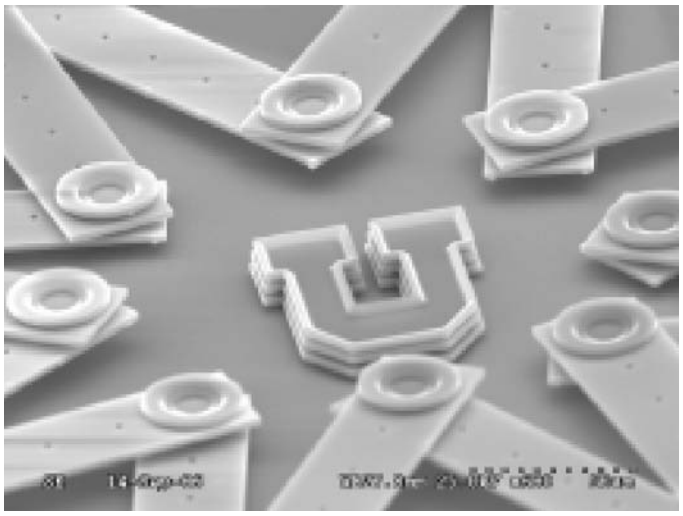
SDR uses software technologies running on generic hardware platforms to process radio signals. Software radios find applications in the military and cell phone services that need a wide range of changing radio protocols in real time, an enabling technology for future wireless systems.

Cognitive radio technologies run on generic hardware platforms to process radio signals. Software radios find applications in the military and cell phone services that need a wide range of changing radio protocols in real time; an enabling technology for future wireless systems.

Cognitive radio technology has been presented as one possible solution to the spectrum-access obstacle based on SDR technology. From a user's perspective, a cognitive radio network operates identically to a standard wireless network. However, cognitive radio nodes are designed to be "aware" of the other users' spectra, and avoid interfering with them. A cognitive radio network is built to coexist in a given portion of the spectrum with the legacy devices to which the spectrum is assigned.

The Wireless Communications Laboratory at the University of Utah has been active in research in SDR and cognitive radio technology since 2005. The current research focus in the laboratory is filterbank based multi-carrier cognitive radios, and physical/MAC layer and cross layer optimization of multicarrier communication system. An SDR testbed based on Universal Software Radio Peripherals (USRPs) has been developed to perform MIMO measurements. The current team members of the Smart Radio Challenge team are Peiman Amini, Ehsan Azarnasab, Salam Akoum, Xuehong Mao, Shafagh Abbasi, and Harsha Rao. The team advisor is Professor Behrouz Farhang-Boroujeny and the team leader is Peiman Amini. Scott L. Talbot and David R. Palchak were also contributors to the first phase of the challenge in 2006.

Press releases can be found at:
www.sdrforum.org/pages/pressRoom/pressRoomDetails.asp?id=321&news_cat=Press%20room



ECE Students Win 2007 Tech Titans Grand Prize

"Yes, we'll prepare you to go out in the workforce and be a Semiconductor Device or Integration or Process Engineer; but have you considered inventing your own microscale device, and creating your own company of 300 employees?"

This challenge, issued in a senior/graduate Microsystems course at the University of Utah, was taken to heart by Ronnie Boutté, who is simultaneously completing a B.S. in Electrical and Computer Engineering, and an M.S. in Mechanical Engineering. Ronnie had already taken several Microsystems classes and was inspired by the potential of MEMS (micro electro mechanical system) devices. So when this challenge came during his junior year, Ronnie dreamt of a microscale deployable device, expanding and contracting in two dimensions much like the Hoberman Arch located adjacent to our Rice-Eccles Olympic Stadium. Ronnie assembled a team of students interested in the technical challenge, and together they took a project course and entered a nationwide MEMS university design competition hosted by Sandia National Labs in Albuquerque. Other members of the team include Nathaniel Gaskin, Taylor Meacham, Justin Horn, Kimball Ward, and Seubpong Leelavanichkul.

While the team of students did not win that competition, Sandia chose to award a free manufacturing run of the design in their silicon surface micromachining process (SUMMiT-VTM), because of the novelty and the opportunity to create commercial devices out of the basic design technology.

Ronnie and fellow students, Nathaniel Gaskin and Taylor Meacham, went on to form a company together, and were awarded the Tech Titans Grand Prize in the spring of 2007, for their efforts (http://www.techtitans.org/). This award again acknowledged the commercial potential for the microscale deployable technology to gain a commercial foothold.

For further information, contact Ian Harvey at 801/581-6162.

Amit Agrawal, Recipient of SPIE $11,000 Scholarship and LEOS Graduate Student Fellowship

SPIE recently awarded the $11,000 DJ Lovell Scholarship to Amit Kumar Agrawal. This is the Society's most prestigious scholarship and is sponsored in part by SPIE with contributions from Labsphere, Inc. Agrawal is pursuing his doctoral studies in electrical engineering in the Department of Electrical and Computer Engineering at the University of Utah under the supervision of Professor Ajay Nahata.

The LEOS Membership Committee has selected Amit as a winner of one of the 2007 LEOS Graduate Student Fellowships. The Fellowship consists of a one-time award of a $5,000 honorarium. The Fellowship Award is intended to help students to pursue their career goals in the field of lasers and electro-optics. The Fellowship Award will be presented at the LEOS Annual Meeting (LEOS 2007), which will be held in Lake Buena Vista, Florida, USA from 21-25 October 2007.

Agrawal's research interest lies in exploring the physics and applications of resonance phenomena at THz pulses using structured metal films. Based on these results, Agrawal is now working on extending these concepts towards the development of surface-plasmon based waveguide devices that can be used in real-world THz applications.

ECE Welcomes Two New Faculty Members

Dr. Cameron Charles

DR. CAMERON CHARLES completed his BS degree in computer engineering at the University of Waterloo in Canada, and his MS degree in Electrical Engineering at the University of Utah, working with Dr. Reid Harrison on microelectronics for bio-implantable systems. He then began work on his PhD in Electrical Engineering at the University of Washington in Seattle, working with Dr. David Allstot. His research work at the University of Washington focused on radio frequency integrated circuit design, with the specific application areas of phase-locked loop frequency synthesizers and phase control systems for phased arrays. He completed his PhD in November 2006, and his dissertation was entitled "A Calibrated Phase and Amplitude Control System for Phased Array Transmitters." Cameron joined the ECE faculty in January 2007.

Cameron is excited to have the opportunity of developing the radio frequency integrated circuit program at the University, and is presently teaching a new graduate course on the topic. His research activities will continue to explore the areas of integrated circuits for phased arrays and frequency synthesis, and he also plans to branch out into the area of low power RF front ends for applications such as wireless sensor networks. In pursuing this research direction he plans to explore the possibilities of emerging ultra wide-band (UWB) radio techniques, which hold the potential for simple, low power transceiver architectures with high data rates.

Dr. Neal Patwari

DR. NEAL PATWARI joined our faculty as an Assistant Professor in August 2006. Dr. Patwari's research is in statistical signal processing. He has taught ECE 5510, Random Processes and ECE 5520, Digital Communications, and will be offering a new graduate-level course in Fall 2007 called "Advanced Random Processes and Applications." His research lab, the Sensing and Processing Across Networks (SPAN) lab, is at the intersection of networking and signal processing. In particular, his lab is developing new estimation and detection algorithms useful to make large distributed networks work more efficiently and more securely. These algorithms and associated analyses are applied to networks like wireless sensor networks, and the Internet.

Neal received his B.S. (`97) and M.S. (`99) in Electrical Engineering from Virginia Tech, in Blacksburg, VA, where he was a researcher at the Mobile & Portable Radio Research Group (MPRG). Between 1999 and 2001, he was a research engineer at Motorola Labs, Florida Communications Research Lab, in Plantation, FL. He received a Ph.D. in Electrical Engineering from the University of Michigan EECS Department in September 2005, where he also was a research associate until July 2006.

ECE Honors Distinguished Alumnus and Distinguished Young Alumnus

The Electrical and Computer Engineering Department was pleased to honor Edward A. Rich as the 2007 Distinguished Alumnus and Dr. Randal R. Sylvester as the 2007 Distinguished Young Alumnus at this year's ECE Technical Open House Banquet.

Edward "Ted" Rich graduated with high honors from the University of Utah in 1937 with a BSEE. At graduation he was awarded membership in the honorary Scholastic Fraternities Phi Kappa Phi and Tau Beta Pi and received a commission in the 367th Field Artillery of the U.S. Army. Beginning in 1937, Ted worked for General Electric Company in Schenectady, NY, and continued to work for GE until 1982. From 1937-1947 he worked in their Large Motor and Generator Department as a designer of large synchronous motors and generators. From 1947-1982 he held various assignments as an Application Engineer supporting GE's Industry Sales and Engineering efforts by working principally with the Mining, Cement and Glass Manufacturing Industries. He has been instrumental in leading GE efforts to apply innovative engineering technologies to their industry processes. Edward Rich is an IEEE Fellow and has been the recipient of several IEEE awards including the Branch Paper Prize, Distinguished Service Award of the Cement Industry Applications Society, Outstanding Award of IAS, Distinguished Service Award of IAS, and IEEE Third Millennium Award.

Dr. Sylvester has over 20 years of experience in communication system analysis and design at L-3 Communications. He has been a lead system analyst/consultant on several military and commercial wireless communication systems including covert/anti-jam spread spectrum systems, wireless internet/telephony systems including ground and satellite systems, and high-rate RF communications with rates of Gbits per sec. In his role as Chief Technologist, Dr. Sylvester is responsible for the development and presentation of the technical roadmap for the division, coordinating the technical exchange of information with several universities, and identifying and overseeing the maintenance of critical intellectual property. Dr. Sylvester has published papers on Military Communication Networks and Multiple Access Communications. He received his BS, ME, and PhD degrees from the University of Utah, where he currently serves on the Engineering National Advisory Council and the Industrial Advisory Board.

Electrical Engineering Alum Honored at Founders Day Awards Banquet

University of Utah and Electrical Engineering Alum, Akhlesh Lakhtakia (MS'81 PhD'83) was honored at this year's annual University of Utah Founders Day Awards Banquet.

Founders Day dates back as far as 1899, when the Utah State Legislature voted to move the University of Utah to its permanent campus on Salt Lake City's east bench. The event coincided with the University's February 28 founding date and inspired a major celebration that continued with the school's 50th anniversary in 1900. Today, it is a time to celebrate the University's place in the community and to honor its outstanding alumni and supporters.

Dr. Lakhtakia is the Charles G. Binder Endowed Professor of Engineering Science & Mechanics at The Pennsylvania State University and a visiting professor of Physics at Imperial College London. He has been widely recognized for his groundbreaking research on nanotechnology and on the behavior of electromagnetic fields and waves in complex materials. He has authored or co-authored more than 575 journal publications, 190 conference presentations, and 15 book chapters.

Dr. Lakhtakia (center) with Sally Ware (right) and Spencer Kinard (left) of the University of Utah Alumni Association.

Clinic Program Helps Students Meet Demands of Real World Engineering

The Engineering Clinic Program has been an essential component of our curriculum since 1986, serving as a unique capstone opportunity for our students, and as a bridge between engineering education and practice. Since then, the program has hosted over 150 projects from 40 industry sponsors, and has involved approximately 700 students. The Engineering Clinic Program is about teamwork and exposure to real-world problems, and the University of Utah is still one of the few Universities that provide this experience. Students participating in a Clinic project typically work in a team of five along with a faculty advisor and a liaison from the sponsor. In addition to applying their knowledge to a specific problem, students must acquire new knowledge and tools, an essential component of the engineering profession. By participating on a Clinic team, students also develop non-technical skills that are increasingly important in the real world of engineering, such as project management and communication.

Each year, we strive to develop a set of projects that spans the diversity of the electrical and computer engineering professions. The projects for the 2007/08 academic year fulfill this goal, with sponsors such as: Hill Air Force Base, L-3 Communications, Micron Technology, Motorola, NAVAIR, Rocky Mountain Power, and Sandia National Labs. Having taken over as Director of the program in 2006, Dr. Steve Blair has a number of plans to improve the Engineering Clinic Program (along with the senior projects in general) and increase its exposure. One of the new initiatives is to create an Industry Affiliates program. This program will allow our Affiliates to develop a stronger connection with the Department, its faculty and students, and will help provide much needed support for Department initiatives to improve our undergraduate program. For example, with the financial support of the Engineering Clinic sponsors and Industry Affiliates, the Department is planning to develop a new laboratory for the purpose of having dedicated project space for Clinic teams and individual projects.

New Academic Home for College of Engineering

The John and Marva Warnock Engineering Building is the new academic home for engineering and computer science students at the University of Utah. The four-story, 100,000 sq. ft. building is now the hub of the College of Engineering "campus." Much of the space in the John and Marva Warnock Engineering Building is dedicated to students, including four auditorium classrooms and five seminar rooms which comprise 450 high-tech classroom seats; 13 group study rooms; generous informal study and meeting areas; and a café. The heart of the building is a two-story atrium and gallery. Over the next 12 months, the Edwin Catmull Gallery will be outfitted with technical exhibits and displays from distinguished alumni and major corporations such as Kennecott, ATK, Bard Access, Williams International, and others. The goal is to surround students and visitors with the art, artifacts, accomplishments and opportunities available to graduates in engineering and computer science related professions. Near the gallery are the Student Affairs Center and the Dean's Office so that all essential academic services are now in one convenient location.

Structurally, the John and Marva Warnock Engineering Building represents several interesting features. The two-story west classroom building was built on top of an existing building (Engineering and Mines Classroom Building), and the two are now integrated via a three story, glass-enclosed stair tower. Throughout construction, every effort has been made to meet or exceed modern standards for energy efficiency and sustainability from the rating of the glass, to the new cooling tower, to the braced frame construction with exposed steel beams for seismic strengthening. Public art for the project was commissioned by the Utah Arts Council with the College of Engineering.

The successful, five-year Campaign for Engineering Excellence is a tribute to the generosity, loyalty and affection of the hundreds of engineering graduates who joined in the effort to create a modern welcoming environment for today's students. With profound gratitude the college acknowledges all of those who have given so generously to make the project a success. Leading the effort as the project's patrons and founders, John and Marva Warnock provided the cornerstone gift of nearly $6M, after previously donating two Presidential Endowed Chairs. In October, the Warnocks added $1.3M to the campaign for the remodeling and modernization of the Engineering and Mines Classroom Building which has now been incorporated into the John and Marva Warnock Engineering Building as a combined physical plant.

The AUTM Survey Ranks the U Among the Nation's Best

The Association of University Technology Managers (AUTM) recently released its survey of 2005 commercialization results for 228 universities, and the University of Utah ranks among the top 25 schools in the country. No other Utah university placed in the top 100. The U's number 19 ranking in commercialization revenue places it above such research powerhouses as Johns Hopkins and the California Institute of Technology. Only 25 of the participating institutions earned more than $10 million in licensing revenues in 2005. The University of Utah's revenues were $16,137,282. "To rank number 19 overall in commercialization revenue is extraordinary given the research funding ranking, and to rank near the top in company formation shows the Legislature's confidence as expressed by the USTAR initiative is well-founded," said Vice President Jack Brittain.

Other impressive numbers for the University of Utah listed in the AUTM survey include licensing dollars generated per research dollars received, ranking the University 12th best in the country, tied with the University of Colorado. The U is also one of only 16 universities generating over $15 million in licensing revenue. Brian Cummings, Director of the U's TCO, says the new survey shows the U is fast becoming recognized as one of the nation's leading economic engines.

Thomas and Mary Lu Judd Distinguished Lecture Series

This Fall we will hold the third installment in the Thomas and Mary Lu Judd Distinguished Lecture Series. The first lecture in this series was presented on September 16, 2005, by Prof. David Dill of Stanford University. He presented a very thought, provoking talk entitled, "I think I voted: E-Voting vs. Democracy."

In 2005, we also heard from Dr. Herbert Reichl of the Technical University of Berlin, Prof. Daniel Costello of Notre Dame, and Dr. H. Peter Hofstee of IBM. The 2006 series began with a lecture by Prof. Thomas Lee of Stanford University in which he gave a very entertaining talk entitled, "The History and Future of the Integrated Circuit." This talk was followed by presentations from Prof. Dimitri Bertsekas of MIT and Dr. Sani Nassif of IBM. This year's schedule is not set yet, but we are certain that it will continue with the excellent tradition of the past two years.

We would like to cordially invite all alumni and other friends of the ECE Department to attend these seminars. There will be three seminars spread out over the Fall Semester. These seminars will be held on Fridays at 3:05pm. We would also like to invite everyone to have refreshments and visit with faculty and students starting at 2:45pm on seminar days. Please watch the calendar on the ECE website for the seminar schedule.

Robert and Mary Jane Engman Double Their Endowment for Scholarships in ECE

In July 2007, the department had the pleasant surprise of receiving a generous addition to the Robert G. and Mary Jane Engman Scholarship Fund. The $200,000 donation more than doubled the existing endowment, which was established in 1992 and has provided scholarships to nearly 100 students over the years. The new gift will enable the department to increase the amount of the scholarships as well as the number of student awards. Robert and Mary Jane Engman have been long-time benefactors to the Department of Electrical and Computer Engineering as well as to the College of Engineering. In 1974, they founded Opto-22, a highly successful company that manufactures hardware and software products that link all kinds of electrical, mechanical, and electronic devices and machines to networks and computers (for further information, please check the website at www.opto22.com). Robert Engman received a BS in Electrical Engineering at the University of Utah in 1953. The faculty of the department is proud of the achievements of its alumnus and his family, and is thankful for their generous support throughout the years.

Thank You, Donors

We are pleased to recognize the following individuals and friends who recently contributed to the Electrical and Computer Engineering Department. Their dedication to the Department is greatly appreciated by the students, faculty and staff. We regret any mistakes or misspellings that may have occurred in assembling the list. To report any errors, or request further information, please contact Holly Cox at cox@ece.utah.edu, or at (801) 581-3843.

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Paul O. Berrett

Blair E. Bona

William A. Boyd

Keith and Beth M. Boyer

Arthur Dominic Bruno

Larry P. Bruno

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Paul R. Christenson

Alden E. and Dian Clawson

Dean L. and Kristen K. Cook

Craig M. Coulam

Benjamin V. and Mary Pat M. Cox

James E. and Beulah Dalley

Douglas L. Datwyler

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Raymond L. and Marjorie F. Fairbanks

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Om P. and Santosh Gandhi

David J. Garner

Dietrich K. and LaDon M. Gehmlich

Tracie M. Glass

Bryant R. Gold

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A. Ralph Greenburg

Vazgen Gregory

Robert J. and Linda G. Grow

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Alumni Update Information

Please go to ***http://www.ece.utah.edu/people/alumsurvey.shtml*** or fill out this form and send it to University of Utah, Electrical and Computer Engineering Department, 50 South Central Campus Drive, Room 3280, Salt Lake City, UT 84112-9206.

Name ______________________________ Graduation Year __________

Address ______________________________ Phone (   ) __________

City ______________ State ________ Zip ________ Fax (   ) __________

E-mail______________________________ Cell (   )__________

Company Name ______________________________ Position __________

News (Professional activities, honors, and awards) ______________________________

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