

# TRANSMISSIONS

## Looking Back—and Looking **Forward**



Of all that has happened in the ECE Department since the last issue of *Transmissions*, the terrorist attack of Sept. 11 is the most significant by orders of magnitude—even though we (thankfully) experienced it only vicariously, as the events became

known and filtered among faculty, students and staff that morning. All of us in ECE extend our deepest sympathy to those affected by that tragedy. As we think of our students, our children and all young people, we are forced to ask ourselves what their lives will be like in the future. The best hope for them and for all civilization is education.

Engineering education—electrical and computer engineering education in particular—has much to offer to improve our lives. On Sept. 11 we learned a powerful lesson—that technology can be turned against people. At WPI, education in the humanities is at least as important as in technical subjects. At this university, we understand and our curriculum demonstrates that only when technology supplies the necessities for a decent standard of living to everyone in the world and universal education provides the basis for everyone to know and understand the world in its complexity and beautiful diversity, will civilization be strong enough to isolate and render powerless the occasional terrorist.

On behalf of everyone in the department, I extend my thanks to the alumni and friends who have made contributions directed to ECE as part of *The Campaign for WPI*. Over the past year, these

generous individuals have included Gordon Henley '75, Gary Krumpholz '78, Earle Laste '67, Allen Levesque '59 and Steven Silva '76.

John A. Orr

### **Conversion** to New ECE Major Nearly Complete

WPI awarded its first B.S. in electrical engineering in 1899. In a few years, as we complete the conversion to our new electrical and computer engineering major, we will award our last EE degree. Recently approved by the WPI faculty, this new major may appear to represent a dramatic change for our department. However, since computer engineering has been an important part of the department (and of virtually all students' programs) for many years, it is correct to say that ECE represents a more accurate name for what we have been doing. As explained in previous issues of *Transmissions*, the ECE faculty chose this route over the alternative of delivering programs in two majors—electrical engineering and computer engineering—from which students would be asked to choose. We believe that these two disciplines are inextricably intertwined at the undergraduate level. Since the requirements of the new major are quite similar to our present EE major, it is entirely possible that we will have our first ECE graduate in the class of 2002.

## Faculty Notes

**Christof Paar** was awarded tenure and promoted to associate professor, effective July 1, 2001. He is on leave this year at the University of Bochum, Germany.

**Alexander Emanuel** received the Trustees' Award for Outstanding Academic Advising for 2001. He is the first WPI faculty member to be honored with all three trustees' awards: scholarship, teaching and academic advising.

**David Cyganski** was appointed by the Provost as the Weston Hadden Professor of ECE.

**Peder Pedersen** was selected for the WPI Teaching Technology Fellowship Program. This program identifies faculty interested in enhancing their teaching with modern information technology, and provides them with technical support, instruction in new pedagogical techniques, and group interaction among the fellows.

**Kaveh Pahlavan** recently completed his second book on wireless communication. Published by Prentice Hall, *Principles of Wireless Networks* was co-authored by Prashant Krishnamurthy, whose doctoral thesis was advised by Professor Pahlavan several years ago.

**Ramdas Ram-Mohan**, who holds appointments in physics and in electrical and computer engineering, was elected a fellow of the Optical Society of America. He was cited for "his development of the paradigm of wavefunction engineering and, through software, making it practical for optimized quantum well laser design."

**John Orr** was elected as a member of the Board of Directors of the International Engineering Consortium (see separate story). Prof. Orr also served as president of the ECE Department Heads Association in 2000-2001.

### Alumni Spotlight

## Newell Award Honors Telecommunications Leader

Robert D. Woog '68, was presented with the Hobart Newell Outstanding ECE Alumni Award on May 3, 2001. The presentation and banquet in the Campus Center Odeum marked the 10th anniversary of the Newell awards. Each year one WPI ECE graduate is honored for outstanding professional contributions.

Bob Woog has been an innovator and a leader in the



Bob Woog's award includes as a remembrance a vacuum tube (state of the art in Newell's time).

momentous changes in the telecommunications industry throughout his career. After graduation he accepted a job with AT&T Long Lines, where he spent 18 years in management positions, including an international assignment as assistant director general of the Telecommunications Company of Iran. In 1987 he brought his extensive experience and business acumen to

*(Continued on next page)*

## Faculty Award

The EE student honor society, Eta Kappa Nu, annually recognizes one **Outstanding ECE Faculty Member**. This year, the honor went to **Professor Alex Emanuel**.



Cyganski

Emanuel

Pahlavan

Parr

Pedersen

several emerging communications corporations, focusing on the financial services community—including IXNet, which merged with Global Crossing. Bob moved to Global Crossing as senior vice president of business development; in that post, he was involved in building one of the world's most extensive global IP-based fiber-optic networks, which will ultimately have 100,000 route miles serving five continents, 27 countries and more than 200 major cities in the world.

During the past two decades, he has served WPI as an alumni admissions volunteer, a member of the Global Committee for *The Campaign for WPI*, and a member of the President's International Advisory Board. As engineer, businessman and entrepreneur, Bob Woog's vision and thoughtful approach to the challenges and opportunities in the telecommunications arena during the past three decades exemplify the criteria of the Hobart Newell Award.

Previous recipients of the Newell Award include: William R. Grogan '46, Paul A. Allaire '60, Ronald L. Zarrella '71, Robert E. McIntosh Jr. '62, John Lott Brown '46, Donald H. Foley '66, H. Richard Freeman '61, Peter B. Myers '46, Alfred A. Molinari Jr. '63 and John C. Petrillo '71.

It's easy to stay up to date on department activities by visiting us online. You may get there directly at

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or from WPI's home page

[www.wpi.edu](http://www.wpi.edu)

We enjoy comments from our alumni and other readers.

Let us hear from you via the Alumni Corner of the ECE Web pages.

## Ted Clancy Receives **Satin Award**

The Joseph Samuel Satin Award for 2001-02 was presented to Professor Edward Clancy '83, who joined WPI in the fall of 2001 from industry. Ted followed his WPI degree with an M.S. and Ph.D. in EE from MIT. His doctoral research was in stochastic modeling of electromyographic signals, and he pursued this and related research at Colin Research America, Aspect Medical Systems and Liberty Mutual Research Center. Since joining the WPI faculty, he has brought his experience and enthusiasm to both the teaching and research realms.

Ted's current research involves the relationship between the electromyographic and mechanical activity of muscle, including data acquisition, analysis and modeling. Much of his teaching has been in the important introductory courses, where his real-world experience is appreciated by the students.



Ted Clancy gets a little help from his family as he receives the Satin Award.

The following WPI awards were received by ECE students for the academic year 2000–01:

Eta Kappa Nu Outstanding ECE Teaching Assistant Award for 2000-01 was presented to graduate student **Ruben Lara-Montalvo**.

Eta Kappa Nu Outstanding Senior Award to **Vishnu Pandey '01**.

Eta Kappa Nu award for Outstanding Contributions to the ECE Department to **David Holl '01**.

The Salisbury Prize (given in 2001 to 15 most meritorious WPI seniors) to **Jennifer Hardy '01** and **Paul Laplume '01**.



Hardy



Laplume

## Wireless **Networking** via Distance Learning

In January 2002 the ECE Department launched a new certificate program in Wireless Communications that is available via distance learning—providing “anytime, anyplace” education in this rapidly advancing field. Designed for working professionals, the program is available to qualified applicants regardless of their location. To earn the certificate, students complete four of the following six courses: Introduction to Networking, RF and Microwave Engineering, High-Performance Networking, Wireless Information Networks, Mobile Data Networking and Advanced Topics in Signal Processing. A minimum of two courses will be offered each semester. Most students will take one course per semester and continue to work full time. Those who complete the certificate program may apply their courses to the M.S. degree.

The new program employs a variety of delivery mechanisms, as appropriate to the particular course content and style of the instructor. Two courses are being offered this semester: High-Performance Networking, taught by Professor David Cyganski, and Mobile Data Networks, taught by Professor Kaveh Pahlavan. Cyganski’s course is 100 percent Web-based, making use of streaming audio (recorded live in the classroom version of the course) accompanied by slides and other graphics on the Web. Pahlavan’s course is delivered with a combination of Web content and videotapes. Professors Reinhold Ludwig and Peder Pedersen will teach in the program in the fall semester.

The ECE Department is widely recognized for its groundbreaking research in wireless data networking. Pahlavan organized the first university laboratory on modern wireless communications in 1985.

## Provost’s **MQP** Awards (also recipients of the ECE Alumni MQP Awards)

**First Place:** Joshua Resnick '01 for “Remediating Fluctuations in Radioactive Decay Measurements,” advisor Professor David Cyganski.

**Second Place:** Karim Nofal '02, Jonathan Perreault '01, John Ruggiero '01 and Antonio Troncoso '01 for “Aviation Warning System,” advisor Professor John Orr.

**Third Place:** Ali Khan '01, Siu Nin Lam '01 and Nai Yin Wong '01 for “DSP-Based Crypto Co-Processor for PDAs,” advisor Professor Christof Paar.

**Nina Simon '02** ECE, received the **Tau Beta Pi Sophomore of the Year Award**. This award recognizes the sophomore who best demonstrates academic excellence as well as the Tau Beta Pi ideals of personal integrity, breadth of interest, adaptability and unselfish activity. Nina was also featured in the ECE faculty-student Rock Concert.

## NASA Goddard Project Program Completes Its Fifth Year

In 1997 Professor Fred Looft inaugurated the WPI Goddard Project Center, working closely with ECE alumnus and Advisory Board member Richard Freeman '61, and the program continues to strengthen. This year's program was supported by a \$20,000 grant from the NASA Goddard Space Flight Center.



Welsh, Lo and Rodriguez work on VHDL design for cloud cover assessment.

Dick Freeman retired in 2000 as chief engineer at GSFC; Stephen Brodeur '68 succeeded him as program director. In the fall of 2001, 28 students from five departments (ECE, Computer Science, Chemical Engineering, Mechanical Engineering and Physics) spent 10 weeks working in teams on nine projects. Though the events of Sept. 11 caused an interruption in the students' work, all the projects were completed with excellent quality. Topics ranged from "Design of Wireless Biotelemetry Unit" to "Investigation of Non-Catalytic Growth for Carbon Nanotubes." The following ECE students took part: Stephen Caldwell, Richard Fowler, Joseph Knuble, Antti Koski, Brian Laplume, Sai Chung (Edward) Lo, Hoang Nguyen, Altin Pelteku, Elionex Rodriguez, Brian Sperlongano, Ben Woodacre and William Welsh.

## Student Activities

The student chapter of IEEE grew in membership and in the number and breadth of its activities in 2000-01. In collaboration with Gordon Library, the chapter staged a membership growth program that resulted in substantial savings on IEEE journal subscription costs by the library. Membership increased from 77 to over 100 student members. A Student Professional Awareness Conference was held in the WPI Campus Center on April 19. The conference addressed issues ranging from the low number of female electrical engineers to leading-edge techniques in digital system design. The enthusiastic officers of IEEE (Vishnu Pandey, chair, David Holl, vice chair, Nicholas Hatch, secretary, Jennifer Scheipers, treasurer, and Nicholas Nigro, corporate liaison) deserve credit for this extremely successful year, along with faculty advisor Professor Hossein Hakim, who provided advice, encouragement and support. The chapter's success was featured in the IEEE's monthly newspaper *The Institute*.

### ECE Rocks

2000-01 will be remembered as the year of the first ECE Student-Faculty Rock Concert, (held April 11, 2001). Faculty band members included Professors Bill Michalson (guitar), Denise Nicoletti (bass), Len Polizzotto (drums) and Rick Vaz (vocals), with introductions and attempts at comedy by Professor John McNeill.

ECE seniors Nick Arcolano, Jay Bose, M.V.S. Chandrashekar, Mike Milner and Nick Nigro opened the show. A highlight of the student set was "My Amputee Dog," composed by Arcolano. Closing the show was a show-stopping performance by ECE women Nina Simon, Jennifer Hardy and Laura Domey.



Vaz, Polizzotto and Nicoletti



Milner, Nigro, Arcolano and Chandrashekar

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Tell us what you're doing.

## Studio **Classroom** Comes to ECE

Recent graduates will recall Room 227 in Atwater Kent as the home of the laboratory for our computer engineering courses. Functional but not particularly comfortable, it worked well for two-student



Brian Laplume '03 and Gina Colangelo '03 pay close attention to instructor Stephen Bitar.

teams constructing and testing logic and microprocessor systems. Over the summer this room was converted into a modern lab-classroom, outfitted with 25 PC-equipped workstations arranged in a classroom layout plus an instructor station and ceiling-mounted computer projection equipment. Each student station (which accommodates two students comfortably) is equipped with standard lab instrumentation as well as a PC. This room has quickly become the location of choice for several courses in which faculty would like to integrate the lecture and laboratory components. This type of "studio format" is conducted in two-hour sessions with short presentations by the teacher that are followed by experimentation by the students, who implement the concepts as they are presented.

# Research and Innovation

## ECE **Collaborates** With UMass on Neuroimaging



The Consortium in Comparative Neuroimaging (CCNI), a collaborative effort of WPI and the University of Massachusetts Medical School, was launched on Dec. 5, 2001. At WPI, ECE Professor **Reinhold Ludwig** is taking the lead, along with ME Professor John M. Sullivan.

The CCNI has two physical locations—at the UMass Medical School campus on the east

side of Worcester, where the MRI machines are located, and in WPI's ECE Department, where RF coil design and experimentation take place. From ECE's point of view, a major goal is the design of better RF coils for high-field MRI machines. These machines are then used to study and map anatomical abnormalities of the brain associated with mental illness.

CCNI faculty are partially funded by the National Institutes of Health. The consortium will be a learning lab for WPI students studying bioengineering, computer engineering, electrical engineering and mechanical engineering, and for UMMS M.D./Ph.D. candidates in psychiatry, neurology, pediatrics and oncology. Two state-of-the-art, ultra-high-field magnetic resonance spectrometers will be central to the research.

The support of several departments on each campus and the commitment of \$3.5 million in infrastructure, personnel and equipment costs were key to the launching of the consortium. New or renovated space has been created in each building. The consortium is also the inaugural center of WPI's recently established Bioengineering Institute. Professor Ludwig has developed a new curriculum to train students in the engineering aspects of MRI.

"For example," he says, "we will develop new radio frequency antenna technology for sending and receiving the electromagnetic signals used in collecting the data that produce the images. Students can generate realistic computer simulations of the magnetic field lines interacting with the animal's brain. These numerical models allow us to predict and optimize the performance of the antenna on a computer. With the theoretical models as a template, students are able to construct a high-performance antenna whose actual performance as a tool for brain imaging can immediately be evaluated in the magnets at UMMS. This practical lab experience will be of tremendous value to future generations of engineering students with interests in high-field magnetic resonance imaging."

## ECE **Inaugurates** Harold Black Award

A new student award was established in 2001. The Harold S. Black Award recognizes an EE senior who has demonstrated outstanding creativity and enthusiasm in engineering problem solving, practical implementation of problem solutions, and exemplary character in his/her contributions to the welfare of the WPI community. This award is named for Harold S. Black '21 EE, the inventor of the concept of negative feedback in electronic amplifiers.

**Joshua Resnick '01** of Syracuse, N.Y., was selected as the first recipient. Joshua, who will be continuing for an M.S. degree at WPI, took the fall semester off to volunteer his services teaching high school students at St. Innocent's Academy in Kodiak, Alaska. He focused his teaching around the collection of very-low-frequency radio data in the high latitudes of Alaska, giving his students real-world experience not possible in the lower 48 states.



John Orr presents the first Harold Black Award to Joshua Resnick '01.

## **WPI** Named to IEC Consortium

Reflecting the quality and level of ECE's involvement in research and education in electronic communications, WPI was elected a university member of the International Engineering Consortium. Chicago-based IEC is a nonprofit organization dedicated to supporting the information industry and its university communities. Since 1944, the IEC has provided high-quality educational opportunities for industry professionals, academics and students. In addition to conducting industry-university programs that have substantial impact on curricula, the consortium also conducts research and develops publications, conferences and technological exhibits that address the major opportunities and challenges of the Information Age. More than 70 leading high-technology universities are currently affiliated with the IEC, reflecting the growing national and international reputation of ECE's communications and networking activities.

The WPI Alumni Association recognized the following ECE graduates at Reunion 2001:

**H. Richard Freeman '61** received a Robert H. Goddard Award for Outstanding Professional Achievement. Recently retired as chief engineer at NASA Goddard Space Flight Center, he is currently principal engineer at Aerospace Corp.

**Donald Foley '66** also received a Robert H. Goddard Award. He is executive vice president at Science Applications International Corp.

**Susan Loconto Penta '86** partner and co-founder of Midior Consulting, received an Ichabod Washburn Young Alumni Award for Professional Achievement.

Over the past year, many ECE alumni have made the news with their professional accomplishments; many more have advanced to positions of leadership in their careers. Following is a representative (but quite incomplete) listing:

**Anup Ghosh '91** received the IEEE Third Millennium Medal for Outstanding Contributions to E-Commerce Security.

**Michael Grady '71** was named executive vice president of Engineering, Chinook Communications.

**William Hwang '89 (M.S.)** was named a partner in the law firm of Goodwin, Procter LLP.

**Peter Rado '70** was appointed vice president of engineering at Sun Microsystems Inc.

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# Faculty **Journal** Publications

**Brown, D.R., M. Motani, V.V. Veeravalli, H.V. Poor and C.R. Johnson Jr.** "On the Performance of Linear Parallel Interference Cancellation." *IEEE Transactions on Information Theory*, July 2001.

**Cakareski, Z. and P.C. Pedersen.** "Statistics of the Integrated Backscatter Estimate from Moving Blood." *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*, March 2001.

**Clancy, E.A. and K.A. Farry.** "Adaptive Whitening of the Electromyogram to Improve Amplitude Estimation." *IEEE Transactions on Biomedical Engineering*, 47, no. 6, (2000): 709-719.

**Clements, K.A., I. Nejdawi and P. Davis.** "An Efficient Interior Point Method for Sequential Quadratic Programming Based Optimal Power Flow." *IEEE Transactions on Power Systems* (November 2000): 1179-1183.

**Ludwig, R. and P. Bretchko.** "Open-Loop Pulsed Hysteresis Graph System for the Magnetization of Rare-Earth Magnets." *IEEE Transactions on Magnetics*, 36, no. 4 (2000): 2015-2021.

**Makarov, S., R. Ludwig and D. Apelian.** "Identification of Depth and Size of Subsurface Defects by a Multiple-Voltage Probe Sensor: Analytical and Neural Network Techniques." *Journal of Nondestructive Evaluation*, 19, no. 2, (2000): 67-80.

**Makarov, S. R. Ludwig and D. Apelian.** "Electromagnetic Separation Techniques in Metal Casting, I. Conventional Methods." *IEEE Transactions on Magnetics*, 36, no. 4, (2000): 2015-2021.

**Makarov, S., R. Ludwig and D. Apelian.** "Electromagnetic Separation Techniques in Metal Casting, II. Separation with Super Conducting Coils." *IEEE Transactions on Magnetics*, 37, no. 2, (2001): 1024-1031.

**McGorry, R.W., S.M. Hsiang, F.A. Fathallah and E.A. Clancy.** "Timing of Activation of the Erector Spinae and Hamstrings During a Trunk Flexion and Extension Task." *Spine*, 26, no. 4, (2001) 418-425.

**Orr, J.A. and A.E. Emanuel.** "On the Need for Strict Second Harmonic Limits." *IEEE Transactions on Power Delivery*, 15, no. 3, (July 2000): 967-71.

**Pedersen, P.C. and A. Grebe.** "Application of Time Delay Spectrometry for Rough Surface Characterization." *Ultrasonics*, 39, (March 2002): 101-108.

**Sunar, B. and C.K. Koc.** "An Efficient Optimal Normal Basis Type II Multiplier." *IEEE Transactions on Computers*, 50, no. 1, (January 2001): 83-87.

**Tingley, R. and K. Pahlavan.** "Measurement of the Time-Space Characteristics of Indoor Radio Channel." *IEEE Transactions on Instrumentation and Measurement*, September 2000.

**Wilhelm, J.E., P.C. Pedersen and S.M. Jacobsen.** "The Influence of Roughness, Angle, Range and Transducer Type on the Echo Signal from Planar Interfaces." *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*, (March 2001): 511-521.