Sounds of War
Dr. Steven Grant, Roy A. Wilkens Missouri Telecommunications Professor of Electrical Engineering & Associate Professor and Pratik Shah, Electrical Engineering Doctoral Student
(article on page 3)
Greetings from Rolla! We hope that this issue of the Current Transmissions finds you in good health and enjoying life.

Last fall, on-campus undergraduate student enrollment increased again, to 391. The addition of the “robot building” exercise to the first circuits laboratory that we started in Fall 2010 has probably contributed to this increase. Also, blended learning was tried on a pilot basis in one section of the Circuits II course by Dr. Theresa Swift in the Fall 2011 semester (described on page 7). It was interesting that the other sections of the course also wanted access to the on-line content. She plans to develop more on-line content and expand blended learning to other sections of the Circuits II course in the Spring 2012 semester.

On-campus graduate student enrollment increased 28%, to 206 last fall. The number of both computer engineering and electrical engineering graduate students increased. To increase the number of CpE PhD students, the department is sponsoring two-year fellowships for up to three new CpE PhD students.

Research expenditures last year were down to $7.5M from the previous year (which was $9M). This amount is still larger than the expenditures two years ago, so long-term the grant expenditures are increasing. Two research projects are featured in this edition of Current Transmissions.

The cooperative BS EE program with Missouri State University (MSU) in Springfield continues with a total of 40 students in the program. We now have three faculty members in Springfield, in addition to consistently delivering 2-3 courses via distance technology to MSU every semester. We should have our first graduates, six of them, in May.

The state political and budgetary situation continues, which means the campus and department continue to face challenges. ECE continues to meet these challenges and adapt to the situation. We will continue to build our core strengths in undergraduate education and graduate research. At the same time, we will continue to develop new relationships with industry and other high-quality academic institutions.

As always, we welcome your input and ideas. I thank each of you for your continuing interest, support, and encouragement. Your support has allowed the department to continue to advance. Please keep in touch!

Kelvin T. Erickson
Chairman and Professor of Electrical & Computer Engineering

Phonathon Edition 2012
Meet the New Faculty

Theresa Odun-Ayo

Dr. Theresa Odun-Ayo joined the Electrical and Computer Engineering department as an Assistant Teaching Professor with the Missouri S&T/Missouri State University (MSU) Cooperative Engineering program at the MSU campus in Springfield, Missouri. She received her B. Eng. from the ATBU Bauchi, Nigeria, in 1995; a M. Eng. from the University of Benin, Nigeria, in 1998; and her EE PhD from Missouri University of Science and Technology in 2011. She worked as a Lecturer with the Nigerian Defense University for two years and as a Principal Electrical Engineer with the Nigerian Airspace Management Agency for five years. Her research interests are in the areas of power system stability and renewable energy.

Sounds of War  Dr. Steven Grant & Pratik Shah (cover photo)

The highlight of the acoustics lab at the Missouri University of Science and Technology is the nearly 800 pound, 36’ X 18’ X 15’ arc truss structure. This structure, called the Immersive Audio Environment (IAE), is a three dimensional immersive acoustic environment to enhance the reality of simulation training for Army personnel. The IAE consists of 64 high-power loudspeakers that simulate 3D sound using AuSIM’s audio simulation technology for loudspeaker display (AuSIM3D Vectsonic). These 64 loudspeakers are a combination of the latest generation of low-frequency sub-woofers and mid- and high-frequency loudspeakers. AuSim’s Vectsonic system uses a Vector Based Amplitude Panning (VBAP) based technology to synthesize stationary as well as moving sounds around the IAE with very high spatio-temporal accuracy.

This project, supported by the Leonard Wood Institute, was carried out in two phases. The first phase consisted of building the IAE and testing the spatio-temporal accuracy of the sound synthesis in the IAE. The second phase was designed to validate the efficacy of training in such an environment. Here, student test subjects learned to fire specially designed laser guns at sounds generated by the IAE, sometimes with and sometimes without background sounds of battle. This involved adding a tracking system for the guns to the IAE. The tracking was accomplished using infrared cameras for position, and inertial sensors for orientation. The group experiments were designed by Dr. Robert Montgomery of the Department of Psychology. Tracking was successfully added to the IAE in summer 2011 and 56 groups of four students each tested in the IAE.

The Grainger Power Engineering Awards

Eight electrical engineering seniors and recent graduates received the Grainger Power Engineering Award for $5,000 each from the Electrical and Computer Engineering department at the Missouri University of Science and Technology.

The awards are funded by a $1.3 million endowment from The Grainger Foundation of Chicago. Missouri S&T is recognized by Grainger for its ability to attract top students and educate quality engineers, and is one of only six universities in the nation chosen to receive such funding.

Each spring, the awards are presented to electrical engineering graduate and undergraduate students who plan to pursue careers in power engineering. Selection of recipients is based on academic performance, exhibited interest in power engineering and extra-curricular activities. All of this year’s recipients had significant power engineering experience, either through company internships, research projects or design projects.

The 2011 recipients are: Mesay Belayneh, Kenneth S. Campbell, Stephen Gates, Jared Gregory, Jordan Henry, Stephen Vetter II, Kam Kit Yiu and Jie Ang Zhao.

Emphasis Area Available to EE Students

Electrical engineering majors may now opt to have a formal emphasis area identified as part of their degree. The emphasis areas are circuits and electronics, power, communications-signal processing, controls, electromagnetics, and computer engineering. A declared emphasis is not required. Those with a declared emphasis must take at least three courses in the identified area beyond the required breadth courses to fill electives A, D, and E in their program.
**Advanced Electric Drive Vehicles -**

Missouri University of Science and Technology received $5 million in federal funding to establish educational and workforce training programs on advanced electric-drive vehicle (EDV) technologies. The funding is part of a $2.4 billion initiative to speed the development of electric vehicles and battery technology nationwide. Missouri S&T’s education partners include the University of Central Missouri (UCM), Linn State Technical College (LSTC), and the St. Louis Science Center (SLSC).

Under this U.S. Department of Energy grant, Missouri S&T developed a new undergraduate minor in advanced automotive technology to better prepare students for careers in the emerging fields that will develop advanced vehicles. The minor degree program involves collaboration between the Electrical Engineering, Mechanical and Aerospace Engineering, and Engineering Management disciplines.

Missouri S&T also created a new graduate certificate program that is designed for practicing engineers. It is crafted to re-train the existing automotive workforce to educate them about advanced electric-drive vehicles. Other activities include: an undergraduate certificate program for non-degree seeking individuals (UCM/S&T); non-degree safety awareness training certification programs (UCM/S&T); an associate of applied science degree option for technicians to manufacture and work with EDVs (LSTC/S&T); a technical certificate in advanced EDV maintenance for mechanics (LSTC/S&T); educating the public to promote consumer awareness and public engagement (SLSC/S&T).

Dr. Mehdi Ferdowsi, Associate Professor of Electrical and Computer Engineering, is the principal investigator for the project. The strong partnership between Missouri S&T, UCM, LSTC, and SLSC will create a unique opportunity to advance the science of advanced electric drive vehicles while creating new jobs in the state of Missouri.

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**Dr. Sandra Magnus Attends HKN Initiation Banquet**

The Gamma Theta Chapter of HKN held its Fall 2011 Initiation Banquet on November 13 at Missouri S&T. President Kenneth Bassler and the other HKN officers inducted undergraduates Vincent Allen, Austin Domescik, Mark Hickle, Jeremy Johnson, Stephen Moerer, Bradley Trapp, and Janell Woolsey; graduate members Anil Mehta and Arun Gunasekran; and professional members Dr. Sandra Magnus and Dr. Kristen Donnell. Dr. Magnus, S&T alumnus and NASA shuttle astronaut, gave the keynote presentation on her experiences in the shuttle program. She presented the ECE Department with an HKN Medallion that was flown July 8-21, 2011 during the final mission of the Space Shuttle Atlantis, STS-135.

An associated pre-college event was sponsored by IEEE Region 5 and IEEE St. Louis Section. Twenty-four middle-school students and teachers from local schools including Rolla District 31, St. Patrick’s School, St. James R-1, Salem R-80, and Dent-Phelps R-3 attended a pre-college reception and question session with Dr. Magnus. Afterwards, the pre-college participants attended the HKN initiation banquet and met the college students and faculty. One of the teachers commented, “The pre-college event opened the eyes of my students about the possibilities available for their futures.” Eta Kappa Nu Advisors are Drs. Steve E. Watkins, Sahra Sedigh, and Theresa Swift.
Senior Design in the ECE Department is a year-long design course where teams of students first determine a project and submit a formal proposal that includes overall design goals, a budget, and team responsibilities. The teams then build their proposed ideas, and hold a formal demonstration at the end of the semester. In 2011, nearly 50 students participated in the Senior Design course. Some of the projects included: a human-powered bicycle for the St. Louis Science Center to help show kids how difficult it is to generate power; an RFID-based RADAR; automation of the braking system of the General Motors Electric Vehicle I; design of a robot who turns its head in the direction of someone who is speaking to it; design and fabrication of an acoustic array for detecting the source location; design of a hybrid go-kart to show the effectiveness of a hybrid system; and a full-color “Persistence of Vision” display. The ECE Department is proud of our seniors and pleased with the successful design projects completed by these students.

Bill Cushman, Cory Gilliam, Andy Jabrani, and Alycia Yungbluth constructed a hybrid go-kart as their senior design project. Similar to the Chevy Volt, they used a series hybrid powertrain, which includes an internal combustion engine, a generator, a battery pack, and a traction motor. Their go-kart reached 30 mph in 8 seconds. The team members stated this project gave them an in-depth understanding of how hybrid vehicles operate. They all took the EE 309 Electric-Drive Vehicles course in the spring of 2011.

The U.S. Department of Energy, Hutcheson Ford, Phelps County Bank, Investment Realty, and John’s Firestone sponsored this project. The group's advisor was Dr. Mehdi Ferdowsi and their EE 392 instructor was Dr. Kristen Donnell.

Garmin Scholarships

Twenty electrical and computer engineering undergraduate students are receiving $5,000 scholarships and training opportunities, thanks to an initiative created by the Kao Family Foundation and Garmin International Inc. The 2011-2012 recipients are: Stephen Andrew, Nicholas Angles, William Busch, Benjamin Conley, Jonathan Daniels, Kevin Flaker, Steven Grott, Paul Henny, Daniel Herr, Michael Hillstrom, Emerson Lentz, Noel McDaniel, Jackson Meyer, Katelyn Peterson, Samuel Purcell, Benjamin Roberds, Bryce Schumacher, Jordan Sparling, Charles Wright and Brandon Yokeley.

The Kao Family Foundation, established by Dr. Min H. Kao, co-founder and CEO of Garmin, launched the Garmin Electrical and Computer Engineering Initiative in 2007 in part to encourage students to study these high-demand areas of engineering. Missouri S&T receives $100,000 annually to provide $5,000 scholarships to electrical and computer engineering undergraduate students. The students selected also will be given first consideration for one of more than 75 annual paid internships with Garmin International.

ECE Students - Receive IEC Awards

Justin R. Schlechte and Kenneth Scott Campbell, both ECE seniors, received the 2011 William L. Everitt Student Awards of Excellence. These awards are sponsored by the International Engineering Consortium (IEC) which is a nonprofit organization providing quality continuing education, research, publications, and service programs for the international information industry. The Everitt Awards are given to students at member institutions who have demonstrated academic, technical, and leadership excellence and who have interests in communications technology.
IEEE - AESS Pioneer Award

James V. Leonard was selected as the 2011 recipient of the IEEE Pioneer Award from the Aerospace and Electronic Systems Society. He was cited for his pioneering work in the field of aircraft/missile launch systems. He is currently employed in industry as a Senior Technical Fellow at Boeing IDS in St. Louis, Missouri. He is responsible for the aircraft integration of the U. S. Navy air-to-surface Harpoon and Standoff Land Attack Missile into U.S. Navy, U.S Air Force and foreign aircraft. Leonard received his Bachelor of Electrical Engineering degree from the University of Akron in 1961; an MSEE (Power) from Washington University of St. Louis in 1966; an MSEE (Digital) in 1976, a Professional Development degree in 1984, and a Honorary Professional Degree (Computer Science) in 1997 all from the University of Missouri-Rolla. In 2003, Mr. Leonard was inducted into the Academy of Electrical and Computer Engineering.

Dr. Theresa Swift received Educator Award

The St. Louis Section of the Institute of Electrical and Electronics Engineers (IEEE) announced their annual awards for 2011. Dr. Theresa Swift, Assistant Teaching Professor in ECE, was selected as the Outstanding Educator. The St. Louis Section includes eastern Missouri and southern Illinois and incorporates Missouri S&T, University of Missouri-Columbia, St. Louis University, Washington University, Southern Illinois University at Carbondale, and Southern Illinois University at Edwardsville.

HKN News - S&T Student Receives National IEEE-HKN Award

Missouri S&T computer engineering student, Kathryn N. Rodhouse, has been selected as the 2010-2011 National Winner of the Alton B. Zerby and Carl T. Koerner Outstanding Electrical and Computer Engineering Student Award. Each of the over 200 IEEE-HKN chapters may nominate one student each for the award, which is sponsored by the IEEE-Eta Kappa Nu Association. The award recognizes academic excellence, character, and service. Eta Kappa Nu is the honor society for electrical and computer engineering students.

Ms. Rodhouse graduated from S&T in May 2011 with a B.S. in Computer Engineering and is continuing her studies as a masters student. Her undergraduate and graduate advisor is Dr. Steve E. Watkins. She will receive the award next spring at the annual ECE Department Heads Association (ECEDHA) and IEEE-HKN Board Meeting. Rolla students have received the national award four times in the 46-year history of the program.

IEEE & HKN News - Missouri S&T Students Win in IEEE Region 5

Missouri S&T senior in computer engineer, Kathryn N. Rodhouse, was recognized with the IEEE Larry K. Wilson Regional Student Activities Award for her efforts to introduce programming to pre-college students. She also participated in two student competitions. She was the first place winner in the Region 5 Student Papers Competition for her undergraduate research. Ms. Rodhouse and Kevin Robison placed second in the Region 5 Student Ethics Competition in which the students must prepare and present an analysis of a scenario in professional ethics.

The Missouri S&T team of Corbin LeGrand, Max Eisenbraun, Blake Lemons, Taylor Clonts, Tim Johnson, and Brad Collins placed third in the Region 5 Robotics Competition. A second S&T team of Mike Carter, Chris Bessent, Casey Fischer, and Abdul Alhowaid participated in this competition as well.

The April 16th student events were held at the 2011 Region 5 Annual Conference of the Institute of Electrical and Electronics Engineers (IEEE). The conference was in Baton Rouge, Louisiana. Region 5 includes states of Arkansas, Colorado, Kansas, Louisiana, Missouri, Oklahoma, Texas, and parts of the surrounding states. Dr. Steve E. Watkins, Professor in ECE, coordinated the student events for Region 5.
Last semester, the 8 a.m. section of EE 153, the second sophomore circuits class, had a different look. While the 9 a.m. and 1 p.m. classes still maintained their traditional lecture format, the 8 a.m. section was taught as a blended class and only met face-to-face twice a week. The 8 a.m. students could watch their lectures from their dorm room or anywhere else a computer was available. Lectures were recorded as voice-over-PowerPoint and the majority of theoretical material was covered in this form. Face-to-face class time was spent in more active learning exercises with students frequently spending class time working together to solve problems rather than watching a problem worked out on the chalkboard. Students were able to pause and repeat lectures until they were sure that they understood the material rather than frantically copying notes from the chalkboard. They had already watched the lecture when they came to class and were able to ask more in-depth questions about the material and were also ready to apply it.

The response from the students have been very positive to the new approach. Support for the development of the online material was made possible through the eFellows grant program, a campus initiative to encourage the development of blended and online learning at Missouri S&T.

Faculty Awards and Special Recognitions

2011 Faculty Research Excellence Award
Dr. Jun Fan

2011 Outstanding Teaching Award
Dr. Kurt Kosbar, Dr. John Seiffert, Dr. R. Joe Stanley, Dr. Reza Zoughi

2011 Teaching Commendation
Dr. Daryl Beetner, Dr. Mariesa Crow, Dr. Jun Fan, Dr. Jonathan Kimball, Mr. Roger Younger


Dr. Steve Watkins, Coordinator, ASEE Midwest 2012 Conference, September 19-21, 2012, Missouri S&T Registration and more information available at: aseemidwest2012.mst.edu

Dr. Donald C. Wunsch II, the Mary K. Finley Missouri Distinguished Professor of Computer Engineering

Survey of Clustering Algorithms, co-authored by Dr. Donald C. Wunsch II

Thanks For Your Generosity

Electrical and Computer Engineering alumni pledged $92,587 in gifts during the 2010-2011 fiscal year. Thank you for your generosity! We used your support last year to fund undergraduate student travel to conferences, scholarships to undergraduate students, senior design projects, and new faculty equipment and travel. "The students are the real beneficiaries of your phonathon gifts," says Dr. Kelvin Erickson, Chair of Electrical and Computer Engineering. "Your support makes a big difference on my ability to say yes to the students."

This year, we will begin calling our alumni on March 1. When the phone rings, please take a moment to share some of your Rolla experiences with a current student, and say "Yes" when asked for a pledge. Taxpayer support accounts for less than 30 percent of the university's revenue, making your contribution a vital ingredient in the revenue pie.

Your gift continues to matter very much......Private funding helps distinguish Missouri S&T from other universities, increasing the value of your education. Any amount you give will be appreciated, and most importantly, your participation will help make S&T a leader in alumni giving among public universities.

Phonathon Edition 2012
CURRENT TRANSMISSIONS

ELECTRICAL & COMPUTER ENGINEERING - MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY

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Name: ___________________________________________ Phone: _______________________
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