

Electrical Engineering and Computer Science

EECS NEWS



UNIVERSITY
OF KANSAS

2012

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EECS Chair
Glenn Prescott

Editor
Michelle Ward

Contributors

Maureen Altman, JoAnn Berner, Elizabeth Dracobly, Cody Howard, Jill Hummels, Brendan Lynch, and Pam Shadoin

EECS

Eaton Hall/University of Kansas

1520 West 15th St., Rm. 2001

Lawrence, KS 66045-7608

Phone: 785.864.4620

e-mail: info@eeecs.ku.edu ■ www.eeecs.ku.edu



INTERNATIONAL AWARD

Shannon Blunt received the Nathanson Memorial Radar Award, which recognizes one researcher under the age of 40 for outstanding contributions to the field of radar.

NSF SCHOLARS

Reba Liggett and Angela Wright are pursuing their passion for renewable energy and helping educate younger students.



ALUMNI PROFILE

Michael Swink (BSCoE '93 MSEE '95) developed an easy-to-use reporting tool for soldiers on patrol.

FRONT COVER

EECS seniors Danielle Fuller, Gordon Fry, Aaron Gillespie, Priya Mishra, and Justin Robertson wait to walk into Allen Fieldhouse for the School of Engineering graduation ceremony in May.



Growing up in central Kansas, **Reba Liggett** never doubted the abundance of wind. Now the EECS senior is learning how to harness wind and other renewable energy sources through a National Science Foundation program. Reba and **Angela Wright** have received Scholarships in Science Technology, Engineering, and Mathematics (S-STEM). The S-STEM program recruits academically talented and underrepresented students with financial need and provides them with research and professional development activities (page 17).

Reba is among the many EECS students who seek out exceptional opportunities. Successful internships led to full-time engineering positions in Silicon Valley for **Gordon Fry, Brady Maasen**, and **Parker Roth** (pages 13 and 15). EECS senior **Emily Dellwig** led an interdisciplinary KU team in designing and building an electric racecar that won nearly every category and received the prestigious IEEE Engineering the Future Award (page 16). EECS welcomed new doctoral student **Erik Hornberger** who received a prestigious Self Graduate Fellowship (page 19) and wished **Nicolas Frisby** (Ph.D. CS '12) success on his postdoctoral fellowship at Microsoft Research Cambridge (page 22).

In addition to their hard work and dedication, our students succeed because they learn from leading experts in their fields. Unlike many programs, EECS professors teach all undergraduate courses. Seniors honored two EECS professors in 2012. Distinguished Professor **Victor Frost** was a finalist for the university-wide H.O.P.E. (Honor for an Outstanding Progressive Educator Award), and Associate Professor **Prasad Kulkarni** won the Department's Talley Teaching Excellence Award (pages 7 and 10).

EECS faculty members were honored for their research as well. Associate Professor **Shannon Blunt** received one of the highest honors in the radar field with the Fred Nathanson Memorial Radar Award (page 8). The prestigious international award recognizes one researcher under the age of 40 for outstanding contributions to the field of radar. I look forward to seeing what Shannon will accomplish in his next 40 years. Distinguished Professor **Joseph Evans** was invited to serve on the national Computing Community

Consortium (CCC) Council, which identifies high-impact research within computing. The Computing Research Association and NSF established the CCC. Additionally, our affiliated research centers have built a state-of-the-art anechoic chamber and high performance computing facility (pages 26 and 28).

We have rolled out a number of recruitment initiatives this past year, which have led to double-digit percentage gains in both undergraduate and graduate enrollment (page 5). Our recently established undergraduate Interdisciplinary Computing degree program admitted seven new students this fall. The program combines expertise in Computer Science with one of five fields of study: astronomy, biology, chemistry, geography or physics. Interdisciplinary Computing graduates will be able to tailor computation tools to that specific field. The Department created the new undergraduate Information Technology degree program at the Edwards Campus (page 6). In its first semester, the program enrolled seven students and had over 140 inquires. We launched the Graduate Distance Learning Program to meet the needs of working engineers and industry across the Kansas City metro (page 4). Engineers are able to earn their master's degree in Electrical Engineering within three years while continuing to work full-time.

It is with great sadness that I share the passing of four EECS Professors this past year. Professors Emeritus **J. Holtzman, Dick Moore**, and **Dale Rummer** and EECS Associate Professor **Doug Niehaus** helped shape and build the Department. All of these men were colleagues of mine, and I had the upmost respect for them. A tribute to them can be found on page 12.

Alumni and friends, we are trying to find ways to stay in touch. We have a Facebook page, www.facebook.com/KUEECS, and a KU EECS alumni group on LinkedIn, and we hope you will join. You are among our greatest assets, and we thank you for your generous support. ■

Glenn E. Prescott
Chair and Professor of EECS

Department Supports Student Groups, Projects

When EECS students wanted to compete in the Institute of Electrical and Electronics Engineers (IEEE) annual regional meeting, KU IEEE president **Jalashree Mehta** knew it would come down to funding. The small group could not afford the expenses associated with the April conference. With the Department's help, the students attended and earned top five finishes in Student Ethics and Circuit Design.

"The Department's contribution was the only reason we could even consider attending the conference," said Mehta. "Conferences like these really help students understand what real engineering is about—the experience was extremely valuable."

EECS Chair **Glenn Prescott** has made project-based learning opportunities a funding priority. In addition to unique events, EECS funds a trio of student clubs with active projects. EECS students design

and build a hybrid racecar through Jayhawk Motorsports (page 16). The KU Robotics group leads multidisciplinary efforts in autonomous systems. EECS students participate in the annual Engineering Expo, which promotes engineering and science for K-12 students.

The Department allocates funds for student chapters of IEEE, the Association for Computing Machinery (ACM), and Eta Kappa Nu (HKN). The groups provide professional development activities, outreach opportunities, and networking and social events, including the annual EECS sponsored Welcome Back Barbecue. ■



Top Photo: Back row (l to r): KU IEEE adviser Shannon Blunt, Brady Maasen, and Luke Ezell Front row: Meghna Eluganti and Jalashree Mehta. The students participated in the IEEE Region 5 Annual Conference in Tulsa, Okla.

Bottom left: EECS senior Justin Robertson shows off his Lego Finger at the 2012 Engineering Expo.

EECS students and faculty enjoyed food and conversation at the Welcome Back Barbecue this fall.

EECS Labs, Computing Commons Receive Upgrades



EECS shop attendant Robert Perez unpacks and replaces over 125 computers over the summer.

This summer EECS Shop staff installed over 125 new Dell Precision T3600 Workstations in five EECS labs and the Computing Commons in Eaton Hall. EECS students in Signal and System Analysis, Programming I and II, Software Engineering I, Data Structures, and Compiler Construction used the new machines this fall. School of Engineering students benefited from the faster, more powerful computers in the Computing Commons.

Students in Circuits II and the EECS Senior Design Lab were the first to use new oscilloscopes in 3005 and 3010 Eaton Hall. EECS students gain intensive hands-on experience with industry-standard equipment.

The Department and EECS student fees supported the purchase of equipment and computers. ■

"Being able to attain a high quality EECS graduate degree through the convenience of distance learning has generated a lot of interest in the program."

– EECS Associate Chair for Graduate Studies Victor Frost

EECS Offers Distance Learning Program

EECS is offering a graduate distance learning program to meet the needs of working engineers and industry across the Kansas City metro.

The Department launched the program in collaboration with Garmin to provide the company's employees with real-time access to graduate courses on the KU campus. Engineers are able to earn their master's degree in electrical engineering within three years while working full time.

"Being able to attain a high quality EECS graduate degree through the convenience of distance learning has generated a lot of interest in the program," says EECS Associate Chair for Graduate Studies **Victor Frost**. "It really is a win-win situation. Companies enhance their productivity and innovation as engineers gain additional knowledge and skills."

Dr. Frost is working to expand the distance learning program to other companies within the metro. The growing high-tech industry, engineering firms, telecommunications companies, and life-sciences organizations present multiple growth opportunities.

Currently, the program offers courses leading to a graduate degree in Electrical Engineering with a focus on RF Systems Engineering. Dr. Frost says industry demand will lead to the opening of additional focus areas and EECS degree programs.

Streaming high definition (HD) video conferencing connects the Garmin classroom with the Distance Learning Classroom in Learned Hall. Five Garmin



EECS Associate Professor James Stiles teaches Microwave & Radio Transmission Systems (EECS 622) in the Distance Learning Classroom in Learned Hall. Garmin students, who are shown on the screen behind Dr. Stiles during class, participate fully in discussions, projects, and other in-class activities.

students enrolled this fall for two distance learning courses. The Department will double the number of distance learning courses this spring and will offer multiple classes in 2013-2014.

Engineers are able to earn their master's degree in EE within three years while working full time.

EECS Associate Professor **James Stiles** said he was pleased with the interactions among the working engineers and traditional students in his Microwave and Radio Transmission Systems (EECS 622) course. He thought the blended course provided a richer exchange of ideas, and the HD video allowed Garmin students to participate fully in discussions and in-class activities.

"Since students view these live lectures at the Garmin facility where they work,

attending class essentially becomes just another event in their workday schedule. Once class is over, they can be back at their desk in a matter of minutes," said Dr. Stiles.

The number of EECS alumni at Garmin, its areas of expertise, and good working relationship with the Department made it an ideal initial partner in the distance learning program, said Dr. Stiles.

Dr. Stiles earned his master's degree through a pioneering program in the 1980's that broadcast courses from Dallas universities to Texas Instruments classrooms across the metro. Dr. Stiles, who believes this partnership helped Dallas become a premiere technology center, wanted to create a similar program at KU and approached Garmin with the idea in 2007.

An informal program produced several graduates, proving its viability. EECS launched the formal program this fall. ■

Building Momentum

Undergraduate and Graduate Enrollment Grows

The Department recorded double-digit percentage gains in enrollment for both the undergraduate and graduate programs this fall.

The 189 new undergraduates this fall, represents a nearly 19 percent increase. In part, the rise can be attributed to a unique gift program. The 2011 and 2012 EECS incoming classes have received Android tablets. The tablets allow students early programming and development experience on the world's most popular mobile platform. Introductory courses are more interactive as professors prepare simplified projects for students on their new tablets. Research has found project-based learning opportunities are key to retaining students through the theory-heavy initial courses.

This fall, seven students enrolled in the new Bachelor of Science in Interdisciplinary Computing (BSIC), which combines expertise in computer science and one of five fields of study: astronomy, biology, chemistry, geography, or physics.

Associate Chair for Undergraduate Studies **David Petr** leads the New Student Seminar (EECS 101). Incoming students have opportunities to interact with EECS alumni, professors, and upper-level students, who highlight the possibilities within EECS. Group activities help new students build friendships with one another that will provide a support system. Dr. Petr's seminar serves as the first line of defense in the student retention battle.

The graduate program achieved an even greater increase with a 32 percent enrollment spike. Targeted recruiting and a renewed visitation program helped bring 41 new graduate students to campus this fall.

New Associate Chair for Graduate Programs **Victor Frost** has implemented a number of changes to the program. He led the overhaul of the graduate student and research sections of the EECS website. The updated sections prominently display the breadth of research and state-of-the-art facilities. One of the first things potential students will do is check out the website, which makes a strong online presence imperative, says Dr. Frost.

He reinstituted a sponsored visitation day. Nine potential students met with faculty members and current students. They received a campus tour, including the two multi-million dollar affiliated research centers. With over half of the visiting students choosing to attend KU, the day was an unqualified success.

While an informal distance learning program with Garmin had produced several graduates, the program needed a more formal structure and upgraded video conferencing system. Dr. Frost led the effort to define the RF Systems Engineering focus area and implement an organizational structure. The program enrolled five Garmin students this fall, and Dr. Frost is working to expand the program to other companies across the Kansas City metro (page 4). ■



Top picture: Nearly 200 new EECS students filled Locke Atrium in September for doughnuts with EECS professors. Students in the New Student Seminar (EECS 101) met with faculty and learned about EECS majors.

EECS alumnus Shane Haas (BSEE '88 and MSEE '89) spoke to students about his career in investment banking. He was featured speaker on the unusual career path day in EECS 101.

EECS Associate Professor James Sterbenz helps new graduate students enroll for their first semester.

"The idea is to reach out to high school teachers to show them what computer science has to offer and the amazing career opportunities that exist."

—EECS Professor Arvin Agah



By Cody Howard

Eight area high school teachers gained app development experience and learned about exciting career opportunities within computer science during a two-day summer workshop sponsored by Google.

EECS faculty and students led the Computer Science for High School (CS4HS) workshop. The workshop presented ideas on how teachers can make computer science more relevant and accessible to students.

"The idea is to reach out to high school teachers to show them what computer science has to offer and the amazing career opportunities that exist. The hope is that these teachers will have a deeper understanding of the field and will then be able to help foster students' interest in the subject," said EECS Professor **Arvin Agah**, who organized the CS4HS workshop.

Graduate teaching assistant **Adhithi Ravichandran** (MSCS '12) led the teachers in lab exercises. They added animations and figures to simple programs and then watched their handiwork on new tablets.

"Just like we do with freshmen enrolled in our computer science courses, each teacher

was provided with an Android tablet. The gift from Google enhanced the hands-on experience during the workshop and will enable them to showcase their work to their students when they return to class," said Dr. Agah.

Liz Krumins, a business/computer science teacher from Seaman High School in Topeka, enjoyed her time in the lab. It gave her an opportunity to experiment with different programs and see what incoming students would be learning. She was already thinking of ways to implement ideas from the workshop into her classes.

The teachers met with EECS alumni and faculty to learn about high-paying careers available to CS graduates and how to best prepare students to succeed.

KU was one of more than 100 universities in North America, Europe, Africa, Asia and Australia selected to participate in Google's 2012 CS4HS program.

Participating educators were from Basehor-Linwood, Lawrence, Topeka, Shawnee Mission and Blue Valley. ■

New IT Program @ Edwards Campus

EECS launched the Bachelor of Science in Information Technology (BSIT) program at the KU Edwards Campus this fall. In its first semester, the program has enrolled seven students and over 140 inquiries.

"We are excited by the tremendous interest shown in our new program, which came in response to demands by commercial, industrial, and government organizations," said EECS Associate Chair for Edwards Campus programs **Hossein Saiedian**.

Tim Johnson and **Rassul Saeedipour** join the program as professors of practice. They will bring their decades of IT experience into the classroom.

BSIT is a collaboration between Johnson County Community College (JCCC) and KU Edwards Campus. The program is designed for working adults seeking higher education during evenings and professionals seeking to enhance their technical knowledge. Students first obtain an associate's degree in IT at JCCC before coming to the Edwards Campus for upper-level courses.

"By enhancing IT educational opportunities within Johnson County, we will help area industries expand their IT infrastructures," Dr. Saiedian said. "Our new undergraduate program will advance the state of the art in IT education, improve regional productivity and competitiveness and offer best practices." ■

Frost Is Finalist for KU Teaching Excellence Award

Distinguished Professor of EECS **Victor Frost** was a finalist for the 2012 H.O.P.E. Award, the only honor for teaching excellence given exclusively by seniors on the Lawrence campus.

Established by the Class of 1959, the H.O.P.E. Award - Honor for an Outstanding Progressive Educator - recognizes outstanding teaching and concern for students.

Dr. Frost teaches courses on communications systems and networks. He brings his research on the Internet and network modeling into the classroom to provide real-world examples. The technologies used in communications networks are rapidly changing so Dr. Frost's courses emphasize fundamentals of network engineering, which will provide a solid foundation for students throughout their careers. Students gain practical experience with state-of-the-art network engineering tools that reinforce concepts taught by Dr. Frost.

"Having the opportunity to contribute to the education of the next generation of engineers is rewarding. Being nominated for the H.O.P.E. Award and then turning out to be a finalist was unexpected and a great honor," said Dr. Frost.

Dr. Frost also serves as an academic adviser for 20 EECS students, helping with course selection, degree requirements, University policies, and career planning.



EECS Distinguished Professor Victor Frost (middle) is recognized as a finalist for the H.O.P.E. Award during the Nov. 17 KU vs. Iowa State football game at Memorial Stadium.

Photo Courtesy of University Relations

After serving for more than a decade as Director of the Information and Telecommunication Technology Center (ITTC), Dr. Frost stepped down in 2008. During his tenure, faculty affiliated with the Center generated more than \$55 million in research expenditures.

The following year, Dr. Frost began a two-year term as a program director at the National Science Foundation. Upon his return to KU in 2011, he became the EECS Associate Chair for Graduate Studies. ■

Seguin Spends Summer at Office of Naval Research



EECS Assistant Professor **Sarah Seguin** was selected to participate in the Office of Naval Research (ONR) Summer Faculty Research program. During the 10-week program, Dr. Seguin worked with Navy scientists and engineers on electromagnetic compatibility (EMC) issues with ultra-sensitive radars and ways to improve spectral efficiency.

Working at the Naval Research Laboratory (NRL) allowed Dr. Seguin to broaden the scope of her research while gaining an understanding of Department of Navy research interests and developing connections with Navy scientists. ■

"I regard him [Shannon Blunt] as one of the up-and-coming young stars of the radar community... I can say that he has a truly international reputation."

—Hugh Griffiths, president of the IEEE Aerospace and Electronic Systems Society

Blunt Receives Prestigious Radar Award

Separating the wheat from the chaff (in an electromagnetic sense) has earned EECS Associate Professor **Shannon Blunt** an international engineering award.

Dr. Blunt received the prestigious Fred Nathanson Memorial Radar Award in May during an awards ceremony in Atlanta. The Institute of Electrical and Electronics Engineers (IEEE) Aerospace and Electronic Systems Society selected Dr. Blunt for the highly competitive honor that each year recognizes one researcher under the age of 40 for outstanding contributions to the field of radar.

"Given the past recipients of this award and the numerous other deserving candidates, I am deeply honored to stand among them," said Dr. Blunt. "I continue to be amazed at the wide array of new technologies being developed to sense the world around us, and I am absolutely thrilled to get to play a part in it."

As a pioneer of waveform diversity research, Dr. Blunt has created innovative techniques to "deconstruct" signals that vary in time, frequency, and space in order to tease out the desired information. He says it is a little bit like listening for whispers in a crowded room. Enhanced sensitivity to signals of interest is one of the fundamental goals of radar research.

The highly competitive Nathanson Memorial Radar Award recognizes one researcher under the age of 40 for outstanding contributions to the field of radar.

"I regard him as one of the up-and-coming young stars of the radar community," said Hugh Griffiths, president of the IEEE Aerospace and Electronic Systems Society and a professor at University College London. "In terms of his stature as a result of this work, I can say that he has a truly international reputation. He has made some significant contributions in the new subject of Waveform Diversity - indeed, he is regarded as one of the flag-bearers in this subject."

The broad scope of signal processing, his area of research, allows Dr. Blunt to explore a variety of related problems at KU's Information and Telecommunication Technology Center (ITTC). For example, while researchers have traditionally looked at ways



EECS Associate Professor Shannon Blunt, left, is presented with the Fred Nathanson Memorial Radar Award in May. The highly competitive award recognizes one researcher under the age of 40 for his or her outstanding contributions to the field of radar.

Photo Courtesy of Joe Bruder

to minimize interference, Dr. Blunt developed a new form of high-speed covert communication that exploits the "crowded room" of radar echoes to embed hidden signals. This new form of communication, developed under a U.S. Air Force Young Investigator Award, may provide soldiers in harm's way a new means to communicate safely.

Dr. Blunt also recently teamed with researchers from the Hoglund Brain Imaging Center (HBIC) at the KU Medical Center to explore new methods for brain imaging. Leveraging a technique he had previously developed for radar antenna arrays, Dr. Blunt and KU Med researchers created the patent-pending Source Affine Image Reconstruction (SAFFIRE) algorithm to enable a more accurate generation of magnetoencephalography (MEG) images, which can be used to detect abnormalities in brain function.

"Dr. Blunt has established himself as an expert and valuable resource on a diverse array of radar-related research topics that may benefit from advanced signal processing," said the late KU Distinguished Professor Emeritus **Richard Moore**, who founded the Radar Systems and Remote Sensing Lab (RSL) in the 1960's. Dr. Blunt now serves as RSL director, continuing the legacy of leading-edge research. ■

Agah Named Associate Dean of Engineering

By Cody Howard

ECS Professor **Arvin Agah** was appointed the Associate Dean for Research and Graduate Programs for the School of Engineering this fall.

Dr. Agah will provide support and resources to enhance research productivity, scholarly activities, and graduate education. He will oversee the development, maintenance, review, and improvement of graduate degree programs.

Dr. Agah has been meeting with department chairs and graduate directors to review data from the past decade to identify areas of growth and – along with top leadership at the School of Engineering – map out a plan for the next few years.

“With more than 15 years of experience at KU, Dr. Agah’s particular track record of success in teaching, research, and service makes him an exceptional choice to lead this effort,” said Interim Dean Stanley Rolfe.

Dr. Agah joined the EECS faculty in 1997. He served as EECS Associate Chair for Graduate Studies from 2005-2009. He recently led the creation of the undergraduate Interdisciplinary Computing program, which aims to attract more students to computer science.

Dr. Agah has received numerous honors, including a Kemper Fellowship for Teaching Excellence and the ING Excellence in Teaching Award. He will continue teaching and research in artificial intelligence and robotics. ■



Associate Dean for Research and Graduate Programs Arvin Agah, far right, takes part in the groundbreaking ceremony for the Learned Engineering Expansion Phase 2 project with other School of Engineering dignitaries this fall.

Photo by Jill Hummels

Leuschen Receives Miller Award for Research

Associate Professor **Carl Leuschen** received the Miller Professional Development Award for Research during the School of Engineering’s spring graduation ceremony in Allen Fieldhouse. Chair **Glenn Prescott** accepted the honor and \$4,000 check for Dr. Leuschen, who was collecting data on the polar ice sheets.

Dr. Leuschen serves as the Deputy Director of the Center for Remote Sensing of Ice Sheets (CReSIS), a National Science Foundation Science and Technology Center. He and fellow CReSIS researchers are developing new technologies and computer models to study the present and future contributions of the Greenland and Antarctic ice sheets to sea-level rise.

Recently, Dr. Leuschen led the development and deployment of the largest antenna array ever flown on a NASA aircraft. The array was able to record the first-ever mapping of the internal glacier layers located very near the icebed in the Arctic and Antarctica. Better understanding of basal conditions—whether ice is frozen to the bedrock or a lubricating layer of water exists between the two—will allow researchers to more accurately predict glacial flow.

“He is a good researcher and teacher,” said doctoral student **Aqsa Patel**, who conducts research at CReSIS. “He knows his subject really well and he can make complex concepts interesting.” ■



EECS Associate Professor Carl Leuschen (left) and EECS Research Professor Fernando Rodriguez-Morales examine a radar system during CReSIS aerial survey of the West Antarctic Ice Sheet.

Photo Courtesy of PolarTREC

"Professor Kulkarni is a great professor because he is as kind as he is intelligent."

—EECS senior Drew Manderfeld



EECS senior Danielle Fuller, left, presents Assistant Professor Prasad Kulkarni with the Harry Talley Teaching Excellence Award at the Graduation Banquet in April.

EECS Assistant Professor **Prasad Kulkarni** won the Harry Talley Teaching Excellence Award at the Department's Graduation Dinner and Awards Ceremony in April. The Talley Award recognizes the professor who has contributed significantly to graduating seniors' education and has developed a strong rapport with them.

"Professor Kulkarni is a great professor because he is as kind as he is intelligent. He knows what he is talking about and he makes a real effort to keep his students involved in class," said EECS senior **Drew Manderfeld**. "He possesses the rare quality of putting as much effort into teaching as he wants us to put into discovery and learning."

EECS senior **Jason Gevargizian** does not remember a teacher ever learning students' names as quickly or working as hard to involve all students in lectures. Gevargizian had him for Compiler Construction (EECS 665), a course Dr. Kulkarni developed.

"Dr. Kulkarni is not only responsive to his students but also tailors his responses to meet our needs. He is incredibly dedicated to helping his students improve and succeed," said Gevargizian.

EECS senior **Jason Eslick** notes how Dr. Kulkarni takes time to learn about students and offers them helpful advice. He provides undergraduate research opportunities, allowing students to apply what they are learning to real-world challenges. Eslick conducted software systems research under Dr. Kulkarni.

"Professor Kulkarni is a great teacher both in the classroom and out of the classroom. He knows his subject field very well, and can effectively convey concepts," said Eslick.

Dr. Kulkarni's research, which focuses on building more secure and better performing software systems, forms the basis of multiple courses, including EECS 665, Virtual Machines (EECS 738), and Security and Performance (EECS 700). ■

Evans to Serve on CCC Council

Distinguished Professor **Joseph Evans** has been appointed to a three-year term on the Computing Community Consortium (CCC) Council.

Established in 2007 by the Computing Research Association and National Science Foundation, the CCC seeks to provide leadership and the mechanisms for the computer research community to identify high-impact research.

Dr. Evans is among the 18 leading computing researchers who serve on the CCC council, which oversees the organization.

"I am extremely honored by this appointment. The work of the CCC is critical to the future of computing research," said Dr. Evans.

Dr. Evans has held leadership positions at NSF and KU. He was a program director at NSF from 2003 to 2005. Upon his return to KU, he led the University's Research Information Technology and then served as Director of the Information and Telecommunication Technology Center (ITTC).

In addition to his roles in academia and government, Dr. Evans has successfully commercialized his research. He has co-founded several companies, including a network gaming company acquired by Microsoft in 2000 and a defense-oriented venture acquired by General Dynamics in 2010. ■

Liu Receives New Editor Postion, Research Grants

Assistant Professor **Lingjia Liu** was selected to become an editor for IEEE Transactions on Wireless Communications (TWireless), the leading international journal in wireless communications.

"Dr. Liu is an outstanding researcher in the fields of fundamentals and applications of cellular and ad-hoc networks," said Andreas Molisch, a professor at the University of Southern California, who nominated Dr. Liu for the position. "On top of that, he has experience in industry and academia."

Dr. Liu is developing technologies that will enable future wireless systems and networks to support heavy traffic, while providing reliable and secure service for time-sensitive applications, such as streaming video and web conferencing. By

increasing the efficiency of wireless communications, more users and applications will be able to use the increasingly crowded radio spectrum.

This fall, Dr. Liu received a National Science Foundation (NSF) award to develop a unified framework for the design and the analysis of heterogeneous relay networks for mobile broadband communications. While relay networks increase the coverage area and transmission speed of networks, they potentially produce a queueing delay, as jobs wait in the queue to be executed. The delay negatively affects time-sensitive applications. Dr. Liu will analyze multi-hop relay networks with special attention to their queueing delay and determine load-balancing methods to maximize overall network efficiency.

In industry-funded research, Dr. Liu is evaluating two-dimensional multiple input, multiple output (MIMO) antenna technology for Samsung Research America-Dallas. MIMOs use multiple antennas at both the source transmitter and the receiver to provide speed, range, and reliability without the need for additional bandwidth or power. Next-generation MIMOs, known as two-dimensional Massive MIMOs, use hundreds of low-power antennas to provide higher data rates, increased link reliability, and power savings.

Dr. Liu will conduct performance evaluation of two-dimensional Massive MIMOs under real-world conditions. He will incorporate practical constraints, such as realistic channel feedback, antenna configuration, and transceiver architecture. ■

Prolific Researcher Earns Bellows Scholar Award

Professor **Ron Hui**'s strong teaching evaluations and leading-edge research earned him a Bellows Scholar Award and a \$4,000 fellowship from the School of Engineering this spring.

Along with his extensive knowledge, Dr. Hui brings a sense of humor to his electronic circuits and fiber-optic systems courses. Students note his friendly demeanor, open-door policy, and ability to clearly explain complex ideas.

"He's really lively, lighthearted, and extremely intelligent," said graduate student **Adam Crifasi**, who has had Dr. Hui for undergraduate and graduate courses. "He's funny and keeps class interesting."

To date, Dr. Hui has 16 U.S. patents. His optics research has wide-ranging applications, from ultra thin solar panels to a powerful, affordable laser microscope for biomedical use.

"Dr. Hui has been a dynamic and enthusiastic mentor," said **Peter Adany** (Ph.D EE '12). "He helped me discover rewarding paths towards my own academic and professional career through his vision, leadership, and intellectual spirit."

This spring, Dr. Hui presented Digital Subcarrier Cross-Connects (DSXC), which could fundamentally change the architecture of the Internet transport network, at the University Research



Graduate students Nahal Niakan and Neiza Torrico (middle) and EECS Professor Ron Hui attend the EECS Welcome Back Barbecue. Dr. Hui earned the Bellows Scholar Award in May.

& Entrepreneurship Symposium. The university-based technology showcase for venture capitalists and entrepreneurs invited only 120 applications nationwide, of which 31 were chosen for presentations. ■

Professors Leave Mark on EECS

Three longtime professors, whose leadership and vision helped guide the Department through the last half of the 20th century, have passed away. They will be remembered for their world-class research, passion for teaching, and kindness to fellow faculty and staff.

Richard Moore

EECS Professor Emeritus Richard Moore, a pioneer in the field of remote sensing, died on Nov. 13, his 89th birthday.

Dr. Moore spent over 40 years at the University of Kansas, where he developed powerful tools that transformed weather forecasting and climate change monitoring.

He came to KU in 1962 as the Black & Veatch Distinguished Professor of Electrical Engineering. He established the interdisciplinary Remote Sensing Laboratory (RSL) two years later. RSL pioneered the use of short wavelength (microwave) radar systems for satellite-based remote sensing.

"As a student, I knew that Dr. Moore was a world-class expert and engineer; now as a faculty member, I recognize what great foresight he had when establishing RSL. His efforts and vision have had a tremendous impact and will continue to do so for years to come," said EECS Professor **Chris Allen**.

Dr. Moore received many accolades during his career, including the Australian Prize for Remote Sensing and the Italian Center Remote Sensing Award, both in 1995.

Though he retired in 1994, Dr. Moore led sponsored research projects until 2004.

Dale Rummer

EECS Professor Emeritus Dale Rummer passed away in October. He was 86.

Dr. Rummer was instrumental in helping build the Electrical Engineering Department during his nearly 50 years at KU. His passion and dedication are honored through the Rummer Award, which recognizes outstanding workmanship and innovation on senior design projects.

"He was an engineer's engineer-passionate about design and building. It was clear he enjoyed teaching, and students liked and respected him," said Distinguished Professor **Victor Frost**. "He was a true gentleman."

In 1949, Dr. Rummer became an instructor in the Electrical Engineering Department. He was promoted to Associate Professor in 1967 and full Professor in 1979. He retired from KU in 1994.

Julian "J." Holtzman

EECS Professor Emeritus Julian Charles "J" Holtzman died in April. He was 77.

Dr. Holtzman began his long teaching career at KU in 1969. He served as Associate Chair of Electrical and Computer Engineering from 1972-79 and Chair from 1979-85. During this time, he secured funding and resources to help build the undergraduate and graduate programs.

Dr. Holtzman served as the first director of the Center for Excellence in Computer Aided Systems Engineering (CECASE) and championed the transfer of university-based research to Kansas companies. ■

Honoring Niehaus' Passion, Precision

EECS Associate Professor **Doug Niehaus** passed away on Aug. 21.

"Doug was a dedicated teacher and researcher whose passion, intellect, and preciseness made us a better Department. He will be missed," said EECS Chair Glenn Prescott.



Dr. Niehaus, who had been on the EECS faculty since 1993, taught courses in programming, software engineering, operating systems, and real-time computer systems.

When **Angela Wright** was having trouble debugging programs in Programming II, Dr. Niehaus worked with her to break down the steps and even related them to parenting. It helped the mother of three better understand the detailed and tedious process.

"He would ask us questions to find a subject that we knew and felt comfortable with and he would relate it to the projects that we were doing," said the EECS junior.

The Doug Niehaus Memorial Fund has been established to celebrate his love of teaching and commitment to students. To make a donation, please go to www.kuendowment.org. ■

New Graduates Land Silicon Valley Jobs

Silicon Valley has grown more crimson and blue with the addition of **Gordon Fry** and **Brady Maasen**, who both graduated this spring with bachelor degrees in electrical engineering. They are Applications Engineers in ON Semiconductor's Solution Engineering Center in Santa Clara, Calif.

The full-time positions grew out of successful summer internships at On, an innovator in high performance silicon solutions for energy efficient electronics.

Fry and Maasen credit their EECS education with its balance of theory and application, for preparing them to meet industry demands. They credit the Jayhawk nation for the internship opportunity, specifically **Edward Osburn** (BSEE '98), Director of U.S. Solutions Engineering Centers at ON Semiconductor. Osburn returned to his alma mater to recruit students, even meeting Fry at Old Chicago one evening to discuss internship opportunities when conflicting schedules prevented a more conventional interview.

"The KU EECS program provides a broad and deep conceptual understanding of the EE design fundamentals necessary to continue growing into design engineers and future leaders," said Osburn, who credited Fry and Maasen for their ability to learn complex analog circuits and then apply them to production designs. "EECS students develop the technical background to excel in any area of EE design--from analog to digital logic and from systems to component to silicon-level design."

Fry, a Free State High School standout, looked at numerous colleges before



Gordon Fry (left) and Brady Maasen, who both graduated with bachelor degrees in electrical engineering this spring, are Applications Engineers at ON Semiconductor's Solution Engineering Center.

Photo Courtesy of Gordon Fry

deciding on his hometown university. He excelled in math and science and enjoyed solving difficult problems, which made EECS seem like a "natural fit" for him. He attended the Engineering Expo for years and was impressed by the exhibits and the possibilities within EECS. Finally, the talented trumpet player would be able to be a part of the KU Marching Jayhawks and Basketball Pep bands. He played in the band his freshmen year, but the growing demands of EECS led him to focus exclusively on his degree after his first year.

Fry started out as a CoE major, but after Programming I, he changed to EE. He wanted to pursue less programming and more hardware and systems-level challenges. Fry points to Circuits I and II and Senior Design Laboratory as some of his favorite classes. Fry served as team leader for his senior design project. His

team developed a blood oxygen detector that uses LED tomography, an imaging technique, to highlight parts of the brain not receiving the required amount of oxygen in blood. The prototype, which will be developed by EECS Professor **Ron Hui** and KU Med Center researchers, will aid research in Alzheimer's and other neurodegenerative diseases.

While his courses were demanding, Fry still had to pay the bills. He worked multiple jobs, some more conventional than others. His grader position for EECS Professor **Ken Demarest** was a common student job. Helping conduct brain imaging and language processing research in the Department of Linguistics was a little outside the EECS student norm. And then there was the unprecedented: Fry worked for three years as a switchboard operator at Lawrence Memorial Hospital.

"The KU EECS program provides a broad and deep conceptual understanding of the EE design fundamentals necessary to continue growing into design engineers and future leaders."

—Edward Osburn, Director of U.S. Solutions Engineering Centers at ON Semiconductor

"Working in various jobs taught me how to interact with a wide range of individuals in completely different environments. Constantly working ahead of schedule and knowing what I had to complete every day was key in staying afloat when working two jobs nearly every semester," said Fry.

While Fry replied to a posting listed at the Engineering Career Center, Maasen met with ON Semiconductor representatives at the fall Engineering and Computing Career Fair. His nearly two years of undergraduate research experience with the Center for Remote Sensing of Ice Sheets (CReSIS) impressed them. While working with CReSIS, Maasen helped design power supplies and gained experience with hardware and software, custom printed circuit board design, and software development for data processing.

Maasen first learned of CReSIS in an Introduction to Engineering course. Led by EECS Distinguished Professor **Prasad Gogineni** and headquartered at KU, CReSIS researchers develop new technologies to better measure polar ice sheets and predict

their contributions to sea-level change.

"Working for CReSIS allowed me to see the 'real' side of the EE program. We would talk about things in class, then they would pop up a few days later in the lab at work, and it would bring the whole thing together for me," said Maasen.

"To be working in an environment that you enjoy and developing technology on the cutting edge is a great opportunity. We put our ideas into new products that have yet to hit the market."

—Brady Maasen

For the son of a University of Missouri graduate, it was no small decision to come to KU. But the DeSoto native spent a lot of time in Lawrence growing up and liked it.

In high school, he became interested in the phenomena of electricity and wanted to learn more about it. His interest in electricity and presentations by CReSIS students and EECS Professor **David Petr** in an introductory engineering course led Maasen to EE.

Maasen and Fry share the same favorite courses in Circuits I and II and Senior Design Laboratory. Maasen also served as the team leader of his group project. The team developed a golf driving range simulation device. The device, which consists of an aluminum frame with a net inside and sensors along the outer edge, can provide the same practice and feedback of an actual driving range but at a far more affordable price and in the convenience of a golfer's backyard.

Through CReSIS and his summer internships, Maasen found that he most enjoyed working in the lab. As Applications Engineers, Maasen and Fry will be designing circuits that will be part of computers, servers, and other mobile devices.

"To be working in an environment that you enjoy and developing technology on the cutting edge is a great opportunity. We put our ideas into new products that have yet to hit the market," Maasen said. ■

Students Take Third in Area Programming Competition

EECS seniors **Patrick Flor**, **Chris Hudson**, and **Michael Tabone** placed third in Perceptive Software's Code Rush programming competition. More than 50 teams participated in the inaugural competition in September.

Teams were given six hours to solve 10 problems, which focused on advanced mathematics and computing, as well as everyday knowledge and problem solving. The EECS students solved six problems, one off the top score. They each received an iPad. ■



EECS seniors Chris Hudson (left), Michael Tabone, and Patrick Flor took third place in Perceptive Software's programming competition this fall. For their efforts, they each received an iPad.

Undergraduate Spotlight Meet Parker Roth

Parker Roth is headed to Google after graduation this May. The technology giant wasted no time in offering the standout senior a full-time software engineering position after his 2012 summer internship. The early job offer is a testament to Roth's performance and the quality of the EECS program.

He credits EECS for giving him experience with the tools and practices needed to succeed on real-world projects. In particular, Roth points to Software Engineering (EECS 448) and Functional Programming (EECS 700), which gave him experience on large group projects with unique programming challenges.



What are your top tips for new students?

Make friends early and help each other along the way. Someone may be really good at taking notes; while another student is good at study guides. Everyone seems to bring something to the table that you wouldn't have if you were trying to go it alone.

GO TO OFFICE HOURS! I've become good friends in the last couple of years with my professors and I regret I didn't make these connections/friendships earlier. It also lets them know that you want to be there and are trying to learn what they have to teach.

Get involved outside of engineering. We have great facilities, faculty, and students, but the world isn't just Eaton & Learned. In four years, you will be working with accountants, chemists, IT specialists, and others. It's nice to know their strengths and be able to relate to them.

What is a typical day like?

A typical day starts off with classes. I often try and squeeze in a couple of video games with classmates between class or before dinner. After dinner, I usually meet up with a study group to work on whatever project or assignment is due in the coming days.

What have been some highlights and challenges?

My favorite moments have been when an entire class comes together to help each other study for a midterm or final. Specifically, my Introduction to Operating Systems class all contributed to a study guide that insured we all had a grasp of the material in the days leading up to the final.

What has been your overall experience as an EECS student?

I've really enjoyed the passion the faculty has for their courses. Taking classes outside of Eaton/Learned has made it very apparent how much our professors care about their students and the material.

I have enjoyed the course flexibility within the EECS Department. As a CoE student, one would expect I would take electives related to circuits and electromagnetics, but I found I enjoyed graduate-level programming courses. Not many departments would allow this kind of freedom to a junior/senior.

What have been some of your favorite times at KU?

Anytime the student body was united in celebrating a victory. My ears are still ringing from the Missouri game last year. Beating MU in the final home basketball game and joining everyone on Mass St. when we made it to the Final Four are special memories. No matter your major, we were all proud Jayhawks. ■

"It was a great surprise to see how much the car could evolve in one year. We competed in every event and got to show off the amazing car that we had built."

—Emily Dellwig, team leader of the KU Formula Hybrid car

KU Electric Car Races Past Competition

The KU Formula Hybrid team earned first place in the Electric-only category and received two prominent awards at the Formula Hybrid International Competition in May.

For their capstone project, EECS seniors **Emily Dellwig, Faiz Ahmed, Hilary Barbour, Aric Beaver, Alex Drees, Brett Hermann, Garrett Scarlett**, and four mechanical engineering students designed, manufactured, and tested an electric Formula-style race car. The Department provided \$10,000 for the project.

"The students were amazing, especially the EECS group. This is a very special team who 'wowwed' the judges and organizers," said Jayhawk Motorsports (JMS) faculty adviser Robert Sorem.

Traditionally, approximately 20 mechanical engineering seniors spend their final year building a Formula-style race car for their capstone project. Growing interest in hybrid vehicles led JMS to include a hybrid car along with its standard car last year. JMS moved from a hybrid to an electric car in 2012.

Dellwig, who led the KU hybrid team both years, said the competition allows EECS students to work on a large-scale interdisciplinary project that emulates real-world engineering.

"It was a great surprise to see how much the car could evolve in one year," said Dellwig. "We competed in every event and got to show off the amazing car that we had built."

The KU team was the first to pass the rigorous technical inspection and be cleared for competition. Hermann said the

judges were impressed with the KU car and the willingness of the team to work through the night to fix a few problems uncovered during the inspection.

The 2012 competition was the first year for the Electric-only category. Twenty-four hybrid and electric teams competed in the same events, but were scored separately.

The KU team won the Electric-only design and raced to first place in acceleration and autocross, a 75-meter timed obstacle course. Their fast times launched them into the top overall spot, heading into the final day of competition.

"In my opinion, Engineering the Future was the best award. It considered the multi-disciplinary nature of the teams, how well they worked together, and ultimately the 'most fun to drive.'"

—Robert Sorem

The KU car simply had to finish the endurance event to win the overall title. Battery troubles left the car stalled on the track about halfway through its run. Unable to finish the event, the KU team fell from the top overall spot. Their commanding lead still gave them the win in the Electric-only category.



EECS seniors (l to r) Faiz Ahmed, Alex Drees, Brett Hermann, Aric Beaver, Emily Dellwig, Hilary Barbour, and Garrett Scarlett stand next to their award-winning car in Eaton Hall. The KU team won the Electric-only category at the Formula Hybrid International competition in May.

"It felt pretty awful until we found out we had won the electric category," Hermann said. "It was awesome to see what we could accomplish and how well our car did."

IEEE representatives presented the KU team with two special awards, the Excellence in Electric Vehicle Engineering and Engineering the Future.

"In my opinion, Engineering the Future was the best award. It considered the multi-disciplinary nature of the teams, how well they worked together, and ultimately the 'most fun to drive,'" said Dr. Sorem.

Building on the Formula SAE program, Dartmouth founded the hybrid competition in 2006. SAE representatives at the hybrid competition asked KU to demo the car at the Formula SAE race in May. ■

Cody Howard contributed to article

Engineering Sustainability

Students Pursue Passion in Renewable Energy through NSF Scholarships

Two EECS students are receiving a unique opportunity to conduct research with University of Kansas experts in renewable energy and learn how to integrate sustainable development practices into their future careers.

Reba Liggett and **Angela Wright** are beginning their second year as recipients of the National Science Foundation (NSF) Scholarship in Science Technology, Engineering, and Mathematics (S-STEM). The S-STEM program provides renewable three-year scholarships up to \$10,000 for KU students who are interested in renewable energy and majoring in a STEM discipline. The program recruits academically talented and underrepresented students with financial need and provides them with mentoring and research and professional development activities.

"Finding new ways to develop power sources using renewable energy methods has always been a passion of mine, and when I saw this opportunity to learn from and network with major players conducting renewable energy research, I knew I had to go for it," said Liggett, who hopes to work in solar energy storage after she graduates this spring.

According to program director Judy Wu, Distinguished Professor of Physics and Astronomy at KU, Liggett and Wright were ideal selections for the inaugural class of KU S-STEM scholars. The program aims to unite KU's expertise and resources in renewable energies to train scholars.



Angela Wright (left) and Reba Liggett stand next to the pinwheel they built to show elementary school students how wind energy works. As S-STEM Scholars, the EECS students participate in seminars, demonstration projects, and outreach activities to promote renewable energy.

After graduating with her English degree in 2008, Liggett moved home to Mankato and became a staff reporter for a nearby town's newspaper. Doubting the sustainability of small town newspapers and her interest in writing for them, Liggett enlisted in the U.S. Air Force and began training in July 2009. A previously undiagnosed medical condition led to her discharge.

The unexpected turn of events led Liggett to reassess her future plans. She had left KU wanting to make the world a little better place, and with that goal in mind, she returned to Mount Oread in 2010. This time Liggett is pursuing a bachelor's degree in Electrical Engineering that will allow her to help advance renewable energy.

Liggett first learned about the S-STEM scholarship through a KU tweet about a new scholarship for students interested in renewable energy. Liggett was interested not only in the financial resources but also in the faculty mentoring and renewable energy projects. S-STEM scholars participate in the interdisciplinary Nanotechnology for Renewable Energy course, seminars, field trips, and outreach activities and are eligible to conduct research with more than 15 participating KU faculty members, including EECS Professors **Perry Alexander** and **Ron Hui**.

Outreach activities are among Liggett's favorite S-STEM activities because she can share her passion with younger students. She has participated in KU's Carnival of

The program aims to unite KU's expertise and resources in renewable energies to train NSF Scholarship in Science Technology, Engineering, and Mathematics (S-STEM) recipients.

Chemistry, the Greater Kansas City Science and Engineering Fair, and KU's Engineering Expo. The annual Carnival and Expo events bring hundreds of students to KU to learn about science through fun interactive demonstrations and events. Liggett's group demonstrated how wind energy works by simulating the work done by a wind source (hair dryer) to turn a pinwheel.

Wright put her dream of a college degree on hold to marry and start a family.

The mother of three returned to college in the spring of 2010 to pursue a degree in Computer Science. The idea to specialize in robotics came from an unlikely adviser - her then four-year-old son. As she was telling him about what a computer scientist does, he loved the idea of her working with robots. She did as well.

But in her first semester back, Wright suffered life-threatening injuries in a motorcycle accident. She was flown to KU Medical Center and spent 49 days on life support. She was released from the hospital on May 26 and returned to KU the following month to begin making up her coursework.

"My work in the program has ingrained itself into my strategy for approaching all science from a fundamental standpoint of alternate solutions for energy use..."

—Angela Wright

Wright struggled her first few months back to even get around as she had to use a wheelchair and walker. Through sheer determination and courage, she completed

her spring courses and was admitted later that summer into the EECS program.

The following spring the Department honored her with the Ellermeier Memorial Award, which recognizes the outstanding scholastic achievement of a nontraditional student. Wright says the award gave her the confidence to apply for the newly formed S-STEM scholarship. She was excited about the opportunities the program offered, including the nanotechnology course. From developing new ways to generate energy to reducing the weight and power consumption of electronics, nanotechnologies are transforming numerous fields.

"My work in the program has ingrained itself into my strategy for approaching all science from a fundamental standpoint of alternate solutions for energy use and consumption rather than create items dependent upon non-renewable power sources," said Wright.

Like Liggett, Wright enjoys mentoring students and has participated in numerous events. She has given talks at her children's school and is a strong advocate for web-based interactions between students and S-STEM scholars.

She is helping recruit students from Haskell Indian Nations University and Johnson County Community College. NSF dictates that transfer students be among S-STEM scholars, and as a transfer student, Wright can share her experiences with students.

The two will use Lego robots to create a renewable energy demonstration for the Engineering Expo in February. ■

EECS Scholarships

The Department awarded the following students more than \$271,000 in scholarships for the 2012-13 academic year.

Continuing students

Michael Albert, Bradley Bell, Christopher Hudson, Robert Knight, Jared Mar, Parker Roth, Keeler Russell, Jonathan Stacy, Sean Sweeney, Matthew Werner, Zachary Garber, Tamara Gaynes, Christopher Hale, Peter Lesslie, George Li, Stacy Mar, Devin Mullins, Derek Scalzi, Chandler Schmidt, Ian Weller, Joshua Collins, Shannon Bisges, William Carey, Daniel Collins, Isaac Cook, Koosha Daneshi, Zachary Flies, Ben Guensche, Elise McElhiney, Jonathan Owen, Amanda Parks, Paul Plotkin, Ryan Scott, Cody Soden, Scott Stryker, Andrew Taylor, Brice Thrower, Lee Wu, Jeffrey Cailteux, and Dakota Henke

Freshman

Noah Benham, Roxanne Calderon, Eli Coronado, Bridget Davis, Dylan Dreiling, John Dziadura, Brian Fosselman, Timothy Frese, Kristopher Goering, Jacob Gould, Joseph Greenbaum, Eric Groves, Steven Harms, Scott Heimann, Hayden Kaustinen, William Kolega, Nicole Maneth, Joshua Marple, Jordan Miller, Charles Mohr, Eric Nevins, Eugene Raygorodetskiy, Nicholas Shaheed, Patrick Shields, Brett Siegrist, Jordan Sprick, Megan Teahan, Daniel Theisen, Sierra Tooley, Michael Tubbs, and Sikai Xiao

Transfer Students

Steven Dunning, Gerald Ravenscroft, and Preston Robertson

Graduate Students

Justin Metcalf ■

Data Mining Research Earns Moore Award

Sergey Morozov received the Richard K. & Wilma S. Moore Award for Best Dissertation at the EECS Graduation Banquet in April.

His doctoral research improves the accuracy of recommender systems, which offer personalized suggestions for books, movies, and other products. This kind of tailoring—based on user feedback and history and purchases of others with similar interests—is extremely profitable; Netflix and Amazon reported over 60 and 35 percent of their sales, respectively, were generated from recommendations.

Morozov has developed new collaborative filtering techniques that uncover patterns of behavior and other information that hone suggestions. For instance, finding two people who agree on every movie is unlikely. A more realistic method is to first determine which movies are most relevant to the current recommendation and then look for people with similar interests in this sub-domain. Current systems recommend a comedy based on other comedies, without ever inspecting the genre of each movie.

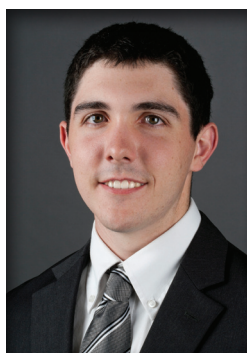
“I believe that data mining has incredible future potential, especially on the Internet. The Moore award recognizes the numerous applications of my work and its importance,” said Morozov.

Morozov is now an assistant professor at the University of Detroit Mercy (UDM), where he teaches undergraduate and graduate courses in software engineering and continues recommender systems research. ■

Hornberger Wins Self Fellowship

Doctoral student **Erik Hornberger** has been awarded a Madison and Lila Self Graduate Fellowship. The four-year award covers full tuition and fees, provides a \$29,000 annual stipend, and includes a unique development program in preparation of future leadership roles.

The Self Fellowship aims to recruit exceptional doctoral students to the University of Kansas. It did just that with Hornberger.



“The Self Graduate Fellowship was the top factor in my choosing to come to KU. Naturally, the financial implications were very appealing, but beyond that, I was interested in the development program, which provides training in a variety of subjects,” said Hornberger, who started the Ph.D. program in Electrical Engineering this fall. “I have numerous interests outside of engineering, and the fellowship provides an avenue to study topics I probably wouldn’t have had an opportunity to pursue otherwise.”

Hornberger comes to KU after an exceptional undergraduate career at Messiah College in Grantham, Pa. On his way to earning his degree in Electrical Engineering in May, Hornberger was the founding president of the Engineering Honor Society, received the President’s Academic Scholarship, and spent one semester at Hokusei Gakuen University in Sapporo, Japan.

Hornberger served as the student director of Messiah’s Collaboratory for Strategic Partnerships and Applied Research, which offers research and project-based learning. Hornberger oversaw 24 projects in 11 countries, including the development of a light aircraft to fly medical missions in developing countries and an electric motorcycle to promote sustainability.

Seeing how engineering can transform lives led Hornberger to pursue graduate studies. He will begin signal processing research this spring under the direction of EECS Associate Professor **Shannon Blunt**. The efficient processing and transmission of data offers a wide range of applications, which appeals to Hornberger.

“The same techniques can be applied to everything from military radar to brain imaging and speech recognition. Signal processing lends itself well to cross-disciplinary research, which is quickly becoming a priority at research institutions all over the world,” Hornberger said.

Nine doctoral students received the Self Graduate Fellowship for the 2012-2013 academic year. Hornberger is the seventh EECS student selected for the prestigious award. Over 140 students have benefited from the fellowship since it was established in 1989.

The Pennsylvanian native knew little about Kansas before his arrival this fall. He enjoys spending time on Massachusetts Street and appreciates how easy it is to get around Lawrence. After numerous bike rides to campus, he no longer believes Kansas is flat. He looks forward to his time at KU. ■

"I have had a very positive experience as an EECS student. KU has an incredible faculty and curriculum."

—EECS doctoral student Justin Metcalf

Graduate Spotlight

Meet Justin Metcalf

A desire to attack the really tough engineering problems led Justin Metcalf back to school. He chose KU for its strong EE graduate program, close proximity to his and his wife's families, and diversity to his educational background. Metcalf graduated with his undergraduate degree in Computer Engineering from Kansas State University in 2006 and joined Lockheed Martin. Working at one of the world's largest defense contractors, Metcalf became interested in signal processing problems.

He earned the Richard K. & Wilma S. Moore Award for Best Thesis at the EECS Graduation Banquet in April. His thesis detailed a new form of high-speed covert communication that embeds hidden signals in radar echoes, which may provide soldiers in harm's way with a new secure communication channel. Under the direction of EECS Associate Professor **Shannon Blunt**, Metcalf is continuing his doctoral studies.



Graduate student Justin Metcalf (left) stands with Associate Professor Jim Stiles who presented him with the Moore Award at the EECS Graduation Banquet this spring.

What are your top tips for new graduate students?

In graduate school, the why is more important than the how. When you are studying, try to understand where everything comes from. Often, you will find a number of formulas all relate back to one key idea. Once you get that fundamental idea, the rest is easy. The same idea applies to research. Once you fully understand the problem you are trying to solve, it is much easier to understand different researchers' approaches.

Finally, make sure you get enough sleep. If you study for an hour or two a day the week before a big test, you will not have to cram the night before the test. You will think better, perform better, and have less stress.

What is a typical day like?

A typical day involves reading papers and writing. Sometimes I write simulations to verify the theories I am pursuing. We have a nice set up in my lab that allows me to easily talk to other graduate students in similar areas, tossing ideas back and forth and exchanging insights.

What have been some highlights and challenges?

The most challenging thing for me was to make the switch to electrical engineering as a graduate student. After receiving my B.S. in Computer Engineering, I went to work at Lockheed Martin. When I decided to come back for my graduate degree in EE, it was very difficult to switch disciplines. However, I'm very thankful I followed my goals.

Share with us your overall experience as an EECS student.

I have had a very positive experience as an EECS student. KU has an incredible faculty and curriculum. The combination of applied and theoretical approaches has given me a good understanding of the key problems in RF signal processing.

Please explain your research.

I primarily work in covert communications and radar detection. The communication system is designed to be invisible to unauthorized users, but easily accessible to authorized users. The covert aspect comes from "hiding" data in radar emissions to decrease the chance that they can be detected. I'm developing tools to quantify exactly how much data can be reliably and securely transmitted in such a system. ■

KU Offers Young Family Support, Resources

Two-year-old Sammy proudly announces his friends are at Hilltop, the KU campus day care, where he spends part of his days. The sweet boy with a huge smile is the child of EECS doctoral students **Mahmood Hameed** and **Aqsa Patel**. While Lawrence is the only home Sammy has known, his parents' journey began on the other side of the world.

The two electronics and communication engineering (ECE) majors met as freshman in 2001 at Osmania University where they were in the same classroom. To maximize resources and students' time, professors moved from classroom to classroom while the 65 ECE students remained together and fostered strong friendships.

The two standouts graduated in 2005. Hameed wanted to continue learning and thought the United States offered him the best opportunities. He chose KU because of its accomplished faculty, particularly, EECS Distinguished Professor **Sam Shanmugan**, whose textbooks are used at Osmania. Additionally, Osmania alumna **Amena Kauser** (MSEE '06) came to KU for her graduate degree and spoke well of the EECS Department.

Patel opted for graduate work in the States as well. She selected the University of North Carolina at Charlotte for its strong EECS program, location, and diversity. She felt her undergraduate degree had given her a good foundation in theory and she was looking forward to immersing herself in research under faculty mentorship.

Unfortunately, the available research opportunities and student-to-faculty ratio were not what she expected and after talking to Hameed about his experiences

at KU as well as the research opportunities with EECS faculty, she decided to transfer in the spring of 2006.

After Patel transferred, the two friends soon began dating. They married in Hyderabad in November 2008. It was a traditional Hyderabad wedding, a five-day event with ceremonies and rituals, delicious mughlai food, and brightly colored outfits.

Hameed graduated with his master's degree in electrical engineering in the spring of 2008 and started as a Network Engineer at Sprint. A mix up with Hameed's visa paperwork left him stranded in India for four months after their wedding. A recession then led to layoffs at Sprint, including the waylaid Hameed. He describes it as one of the low points of his life, watching helplessly as everything he had worked for disappeared.

The following spring Patel graduated with her master's degree in electrical engineering, and the couple reassessed their future. After talking to EECS faculty who encouraged them to continue their education, they decided to stay at KU for their doctorates in electrical engineering. The new doctoral students received some life changing news that fall: they were going



Mahmood Hameed (left), their son, Sammy, and Aqsa Patel attend the KU India Club's DIYA celebration, in honor of Diwali, the Festival of Lights, in November at the Kansas Union.

to be parents. Sameer, nicknamed Sammy, was born on May 25, 2010.

During the first year of Sammy's life, Hameed's mother came over for an extended stay. She offered much needed help and support for the new parents. Like many first-time parents, they were exhausted and struggled to keep up with classes and research.

"I was worried that I was not taking care of the baby properly. I felt like the days flew by, and there was no time to sit down and relax. It was very exhausting and exciting," says Patel.

Over time they got the hang of things and started to piece together a schedule that worked for Sammy and them.

These days the morning routine usually begins with Sammy greeting them with

"Having a family in graduate school requires a lot of sacrifices. We are very lucky to have understanding professors, an excellent day care facility, and a strong group of friends."

—EECS doctoral student Mahmood Hameed

"Mommy, wake up the sun is up." They credit their little one for helping them stay organized. In order to be able to spend quality time with Sammy during the evening, they keep to a strict schedule during the day. Less time has made them more productive, says Hameed, who jokes they only thought they were busy in their pre-Sammy years.

Hameed and Patel both have numerous commitments, requiring them to make a plan for each day.

"Having a family in graduate school requires a lot of sacrifices. We are very lucky to have understanding professors, an excellent day care facility, and a strong group of friends," says Hameed.

They each conduct research with internationally recognized EECS faculty members. Under the direction of Professor **Ron Hui**, Hameed is developing different techniques to process the massive amounts of data being pushed through fiber-optic cables. He is working on various aspects of a communication system, including modulation and pre-filtering at the transmitter and various signal processing algorithms to compensate for fiber impairments at the receiver. The research aims to increase the capacity and efficiency of high-speed data transmission to support a wide range of applications, from broadband Internet to biomedical devices that improve diagnosis and treatment.

At the Center for Remote Sensing of Ice Sheets (CReSIS), Patel has designed and developed the Ku-band radar. The radar measures variation in ice sheet surface elevation, near-surface internal layers, and snow cover over sea ice. It collects data over polar ice with a range resolution of five centimeters or less in snow. CReSIS Director

Prasad Gogenini and Deputy Director **Carl Leuschen** guide her research.

In addition to research, the couple juggles various responsibilities each semester. Hameed has been the graduate teaching assistant (GTA) for Signal and System Analysis (EECS 360) for the last two years. His strong evaluations and desire to teach led him to be selected as a GTA for the Introduction to Digital Logic Design (EECS 140) lab this fall.

"I don't think of it as a job but more like an opportunity," said Hameed. "I am continually thinking of ways to make things interesting for students that will help them grasp and retain concepts."

Patel serves as an appointed Senator for the Stouffer Place Association at Student Senate, actively representing residents—graduate students, students with children, post-doctoral researchers, and non-traditional students—in the KU Student Senate.

Stouffer Place and Hilltop are among the amazing resources that KU has to offer a young family, says Patel. The family spends many nice days at the Stouffer playground. The Stouffer families, who are all far from home, rely on one another and form a makeshift family. Sammy really enjoys Hilltop and has made many friends. His parents are thankful for such a wonderful day care a few feet from their apartment.

With both Hameed and Patel expecting to graduate in 2014 and most likely move out of state, Sammy may not remember his days in Lawrence, but his parents will remind him of his first few years spent as part of the Jayhawk nation. ■

Frisby's Internship @ Microsoft Research

Nicolas Frisby, who graduated this fall with his doctorate in computer science, has received a postdoctoral internship with the prestigious Microsoft Research Cambridge in the United Kingdom. He will begin the three-month fellowship in January.

Frisby will conduct research on tools that greatly reduce the development time for highly secure, dependable software used in lifesaving medical devices, defense systems, financial trading, and other critical applications.



"I am extremely fortunate to have this great opportunity," said Frisby. "These researchers are the ideal mentors and collaborators."

Frisby will work under the direction of Simon Peyton Jones, a founding father of Haskell, a functional programming language that uses advanced math functions to create shorter, more manageable code.

"Nic is an outstanding ambassador for KU and the quality of work we are doing here," said EECS Assistant Professor **Andy Gill**.

Frisby received honors for his dissertation, Reducing the Cost of Precise Types, which allows programmers to leverage Haskell's static safety in a novel way. ■

GRADUATION » »

More than 100 people attended the Department of Electrical Engineering and Computer Science Graduation Dinner and Awards Ceremony at Pachamama's restaurant on April 26. Graduating EECS students and invited guests, along with faculty and staff members, enjoyed a buffet dinner before the awards presentation. While the banquet traditionally has been held on graduation weekend, it was moved up to allow EECS Industry Advisory Board (IAB) members to attend. The spring EECS IAB meeting took place the following day at the Kansas Union.

Outstanding Senior Award

Based on overall achievement, the award is presented to a graduating senior in EE, CoE, and CS.

Mike Zakharov (EE), **Patrick Gegen** (CoE), and **Jason Eslick** (CS)

Ellermeier Memorial Award

A nontraditional student with outstanding scholastic achievement is the recipient of the Ellermeier award. It is given in honor of former EE Professor and Associate Dean of the Graduate School Robert Ellermeier.

George Li

Paul F. Huebner Memorial Awards

Paul Huebner was a KU graduate with a BS in accounting, concentrating in CS, and a graduate degree in CS. The award is intended to reward good teaching and encourage students to consider teaching as a career.

Shalini Dasoju and **Avindra Fernando**

Richard K. & Wilma S. Moore Thesis Award

This award is given in honor of Distinguished Professor Emeritus Richard Moore. EECS Associate Professor Jim Stiles presented the awards for best graduate thesis and doctoral dissertation.

Justin Metcalf (thesis) and **Sergey Morozov** (dissertation)



Graduating seniors Justin Robertson (left), Ola Claire Bangole, and Lamine Kane discuss their future plans.

EECS Advisory Board Member Brian Ruf (center) talks with graduating seniors Danielle Fuller (left), Aaron Gillespie, and Priya Mishra.



Top Picture: Mike Zakharov (left) and Patrick Gegen received the Outstanding Senior Award.

Middle Picture: Graduate students Avindra Fernando (left) and Shalini Dasoju were recognized for excellence in teaching.

Graduate student Annette Tetmeyer (left), graduating MS student Adhithi Ravichandran and Associate Dean for Research and Graduate Programs Arvin Agah celebrate the evening.

Spring 2012

Keith Preston, Ph.D. EE, "A Unified Hardware Software Priority Scheduling Model for General Purpose Systems," Adviser: Dr. Arvin Agah

Christopher Redford, Ph.D. CS, "Evidentialist Foundationalist Argumentation in Multi-Agent Systems," Adviser: Dr. Arvin Agah

Yuan Yuan Zhang, Ph.D. EE, "Spectrally Efficient Multicarrier Systems for Fiber-optic Transmission," Adviser: Dr. Ron Hui

Tawakalit Aduragba, BSCoE
Prabhu Althi Lakshmana, MSCoE
Dawit Askabe, BSCS
Brian Baraban, BSCS
Hilary Barbour, BSEE
Aric Beaver, BSEE
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Alec Kohl, BSCS
Adan Lau Correa, BSEE

Matthew Lee, BSEE
Ji Li, MSIT
Mindy Min Liu, MSCS
Brady Maasen, BSEE
Messan Mabudu, BSEE
Damian Madden, MSCS
Andrew Manderfeld, BSCS
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Aleeza Souvannakhot, BSEE
David Tai, MSCS
Eric Thompson, BSCoE
Brad Torrence, BSCoE
Neiza Torrico Pando, BSEE
Bryan Townley, BSEE
Qian Wang, MSCS
Yue Wang, BSEE
Brian Wasko, MSIT
Ke Xu, MSEE
Jerome Younger, BSEE
Mikhail Zakharov, BSEE
Huan Zhao, MSEE
Zhenguo Zhou, MSCS

Summer

Peter Adany, Ph.D. EE, "Fiber Laser Based Nonlinear Spectroscopy," Adviser: Dr. Ron Hui

◆**Xiaotong Lin**, Ph.D. CS, "Learning Bayesian Networks and Bioinformatics Applications," Adviser: Dr. Jun "Luke" Huan

◆**Brian Quanz**, Ph.D. CS, "Learning with Low-Quality Data: Multi-View Semi-Supervised Learning with Missing Views," Adviser: Dr. Jun "Luke" Huan

Mohammed Alenazi, MSCoE
Austin Arnett, MSEE
Ola Bangole, BSCS
Nicholas Bergmann, MSEE
◆Carl Chesser, MSIT
Alexander Drees, BSEE

Sameh Elghzali, MSIT
Avindra Fernando, MSCS
Brett Hermann, BSEE
Priya Nagarajan, MSIT
Kamakshi Pathapati, MSCoE
Justin Robertson, BSEE
◆Cenk Sahin, MSEE
◆Manogna Thimma, MSCS
Gianpierre Villagomez Saldana, MSCS

Fall

Li Cheng, Ph.D. CS, "An Extensible Model-Based Approach for Analyzing and Testing Dynamic Multi-Tier Web Applications," Adviser: Hossein Saiedian

◆**Hongliang Fei**, Ph.D. CS, "Learning from Structured Data," Adviser: Dr. Jun "Luke" Huan

◆**Nicolas Frisby**, Ph.D. CS, "Reducing the Cost of Precise Types," Adviser: Dr. Perry Alexander

Yi Jia, Ph.D. CS, "Online Spectral Clustering on Network Streams," Adviser: Dr. Luke Huan

Maryam Mahani, Ph.D. CS, "Strategic Structural Reorganization in Multi-agent Systems Inspired by Social Organization Theory," Adviser: Dr. Arvin Agah

Syed Ahmed, BSEE
Bryan Banz, MSCS
Philip Betts, BSCS
Carabajal Calen, BSEE
Kriti Chakdar, MSCS
Wen Chen, BSCS
Patrick Denton, BSCS
Alexander Elting, BSCS
Meghna Eluganti, BSEE
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◆ Honors



Learning from the Past

CReSIS Radar Data Featured in Nature

By Cody Howard

A collection of breakthrough discoveries that provide new details on changes in the earth's climate from more than 100,000 years ago – made possible in part by CReSIS researchers– was featured in one of the world's most prestigious scientific journals.

The article, “**Eemian interglacial reconstructed from a Greenland folded ice core,**” appeared in the Jan. 24 issue of *Nature*. It details findings from a deep ice core drilled in northern Greenland, at the North Greenland Eemian Ice (NEEM) drilling camp. Research at the site is led by the Center for Ice and Climate at the University of Copenhagen, which partners with CReSIS.

“From the findings within the ice core samples, we now know the Eemian period was four to eight degrees warmer than today. We already knew it was warmer, but an eight-degree spike is higher than we realized. We’ve never had data this clear or accurate,” said Dorthe Dahl-Jensen, leader of the Center for Ice and Climate.

Research at the NEEM site centers on climate data contained in layers of ice 1.5 miles deep, brought to the surface in three foot chunks through a hollow, 4-inch wide tube during parts of three summers from 2008 to 2010. Data being analyzed reveal key information about global temperatures, sea-level rise, and changes to polar ice sheets during what

is known as the Eemian period, which began about 130,000 years ago and ended about 114,000 years ago. The period bridged two ice ages and is known for warm temperatures worldwide.

“We’re really excited that the radar and processing improvements that CReSIS has been working on are enabling scientists to better understand the ice sheet and its role in our climate system, especially something as important as reconstructing what happened during the Eemian period,” said CReSIS Research Assistant Professor **John Paden**. “This may be our best analog for understanding the impacts of global warming.”

Beyond the information contained within the small samples of ice brought to the surface for further study, researchers rely on CReSIS radars to extend these results for modeling larger areas of the ice sheet.

“The first and most important parameter to modeling an ice sheet is knowing where the bedrock is, and the radar from CReSIS detects that beautifully,” said Dr. Dahl-Jensen. “The radar detects a lot of internal layering and provides a clear picture of climate transitions over time. By analyzing these images, we can determine the conditions and the age of the ice over a large area.”



CReSIS Engineer Kevin Player (glasses) and CReSIS Research Assistant Professor John Paden test radars in flight.

Photo Courtesy of CReSIS

EECS graduate students **Austin Arnett**, **Reid Crowe**, and **Ben Panzer** and CReSIS engineer **Kevin Player** (BSEE '07 and MSEE '09) and Dr. Paden were among the CReSIS researchers who gathered data at NEEM during 2008-2010. Numerous other CReSIS students, staff, and faculty assisted with installation and processing.

“We have substantially improved the sensitivity and capability of radars used to sound ice and image the ice bed at CReSIS over the last few years, and this is resulting in data that are very useful for a wide range of glaciological studies, including the interpretation of ice cores,” said Distinguished Professor of EECS and CReSIS Director **Prasad Gogineni**. ■

"The chamber is an extremely valuable resource for CReSIS, EECS, and the entire University. We now have the ability to perform measurements that were not previously possible at KU."

—EECS Associate Professor Carl Leuschen

'Quiet' Chamber Enables Advanced Wireless Testing

While many people may think Western Kansas holds the title of quietest place in the state, that award actually goes to a new test facility on the University of Kansas campus. The anechoic chamber, which silences noise and wireless signals and absorbs reflections, allows researchers to evaluate radar systems in a controlled environment, improving radar imaging while decreasing development time and costs.

The Center for Remote Sensing of Ice Sheets (CReSIS) received the \$1.34 million grant from the National Science Foundation to construct the electromagnetically quiet chamber. The large facility, which is available to university and corporate researchers, is located in the new Measurement, Materials, and Sustainable Environment Center next to Eaton Hall.

Available to university and corporate researchers, the large chamber provides a controlled environment to evaluate radar, wireless communications.

Normal background noise can contaminate readings of highly sensitive radar. Thus, the chamber is covered in microwave absorbing wedges, which insulate test objects from cell phone signals and other electronic emissions and absorb reflections created within the chamber. The chamber allows researchers to ensure their radar is working as expected.

"The chamber is an extremely valuable resource for CReSIS, EECS, and the entire University," said EECS Associate Professor and CReSIS Deputy Director **Carl Leuschen**,

principal investigator on the project.

"We now have the ability to perform measurements that were not previously possible at KU. We can test our systems and platforms in an environment where they can be fully characterized."

The 11.58m x 7.29m x 7.36m interior of the chamber, which can fit five hybrid cars side by side or eight stacked, makes it one of the larger facilities in the region.

The easily reconfigurable room allows researchers to test everything from a single antenna to an unmanned aerial vehicle (UAV). With the UAV, CReSIS researchers study the best placement of antennas and search for electromagnetic interference (EMI) problems between the various systems and sensors. Multiple radar, UAV instruments, and other electronics can meddle with one another, corrupting data collection.

The facility gives EECS students valuable hands-on experience with topics such as antenna design, radiation patterns, EMI, and noise analysis. A series of experiments within the chamber will be integrated into



▲ EECS seniors Luke Ezell and Jalashree Mehta prepare the anechoic chamber for antenna measurements.

► The chamber, which is being covered in microwave absorbing wedges, insulates objects from electronic emissions and absorbs reflections.



the undergraduate curriculum, such as the antenna measurements that were gathered during Electromagnetics II this fall.

Associate Dean for Development Glenn Marotz calls the chamber the "jewel" of the new building and is excited about the opportunities for collaboration. He has given tours to representatives from Boeing, Cerner, Sprint, and other companies.

To learn more about rates, the reservation schedule, and equipment specifications, go to <http://chamber.ku.edu/>. ■

Building the Future Internet

Research to Develop More Resilient, Survivable Networks

By Brendan Lynch

It's startling to ponder the numerous ways our society relies almost completely upon the Internet to conduct the business of everyday life. Commerce, communication, and even national security all require a functioning World Wide Web.

"We really depend on the Internet for absolutely everything we do," said EECS Associate Professor **James Sterbenz**.

"Governments depend on it to deliver services, and the military depends on it, and businesses depend on it for commerce and the stock market. We depend on it as individuals to get information, and to do banking, and to buy things — so much so that when the Internet is down, things tend to cease. You go into a store, and the point-of-sales terminals don't work, and they can't even sell you anything."

But without adequate research and preparation, threats such as natural disasters or terrorist attacks could bring the Internet crashing down with grievous consequences. That's why Dr. Sterbenz is leading a \$1.5 million effort funded by the National Science Foundation and Battelle to



design a future Internet that will be much more resilient than it is today.

"There are a lot of weak points," said Dr. Sterbenz. "An example of that is that there was a train that burned in a tunnel under Baltimore a few years ago. It melted all the fiber running through the conduit. And because that was a convenient way to get through the city, many service providers ran their fiber through. So people did lose service because it was a weak point."

The EECS researcher said that an attacker who has probed the network to discover such weak points likewise could do considerable damage, not only to the physical infrastructure of the Internet, but also to the "protocol infrastructure," such as the Domain Name System that translates human-friendly identifiers like www.ku.edu to Internet addresses and the Internet's core routing system, the Border Gateway Protocol.

"These are very critical to the operation of the Internet," Dr. Sterbenz said. "And those do have some vulnerabilities. Attacks against those protocols specifically can have pretty significant impact. People can't get to websites, and communication can't occur."

To advance the robustness of the Internet, Dr. Sterbenz leads a team of researchers who are analyzing the complex networks of computers and fiber that constitute the Internet and World Wide Web.

Redundancy and geographic diversity are keys to a hardier network, said Dr. Sterbenz.

"You want at least two paths between two users, so if one is taken out, you have another one," said Dr. Sterbenz. "The other thing we want is geographic diversity. So you'd like to be able to set up multiple paths between two users such that no point is closer than, for example, 100 miles, so if there's some area-based challenge, you're still able to communicate."

Dr. Sterbenz leads an international programmable testbed called GpENI: Great Plains Environment for Network Innovation, part of the NSF Global Environments for Network Innovation program, which he will use to run experiments to see how new resilience mechanisms work in the real world.

This fall, Dr. Sterbenz and graduate students **Dongsheng Zhang, Santosh Ajith Gogi, Dan Broyles, and Egemen Çetinkaya** received the Best Paper Award at the International Workshop on Reliable Networks Design and Modeling.

Their paper, "Modelling Attacks and Challenges to Wireless Networks," explores how mobile ad-hoc networks (MANETs) respond to attacks and challenges to normal operations. MANETs are built spontaneously, as wireless devices connect and form improvised networks. These self-organizing networks do not require fixed infrastructure, making them ideal for military operations and disaster recovery missions. ■

"The ACF [Advanced Computing Facility] unites University resources and provides an outstanding staff to maintain a secure, energy efficient world-class computing facility."

—EECS Professor Perry Alexander

Advanced Computing Facility Receives IBM Award

ITTC is partnering with IBM Corp. to advance supercomputing at KU. The IBM Shared University Research (SUR) award includes five compute blades, a large memory blade, a graphical processing unit blade, two storage servers, and 72 terabytes of disk storage to the renovated Advanced Computing Facility (ACF). The KU award builds on a donation earlier this year of three IBM BladeCenter chassis.

The ACF renovation, which went online this fall, was funded through a \$4.6 million grant from the National Institutes of Health. More than 3,500 square feet of computing space and 2,400 square feet of support space were renovated.

"It is well-positioned to meet the ambitious data analysis needs of KU biomedical research and to dynamically respond to future computational challenges," said EECS Associate Professor **Jun "Luke" Huan**, who spearheaded the project.

The ACF greatly enhances the computing capabilities of the University, giving researchers a 20-fold increase in computing power to support investigations ranging from biology and disease to national security and climate change.

"At most universities, researchers work department-by-department or individually to get the computing resources they need," said EECS Professor **Perry Alexander**, Director of the Information and Telecommunication Technology Center, which houses the supercomputing facility. "The ACF unites University resources and provides an outstanding staff to maintain a secure, energy efficient world-class computing facility. Now, KU researchers

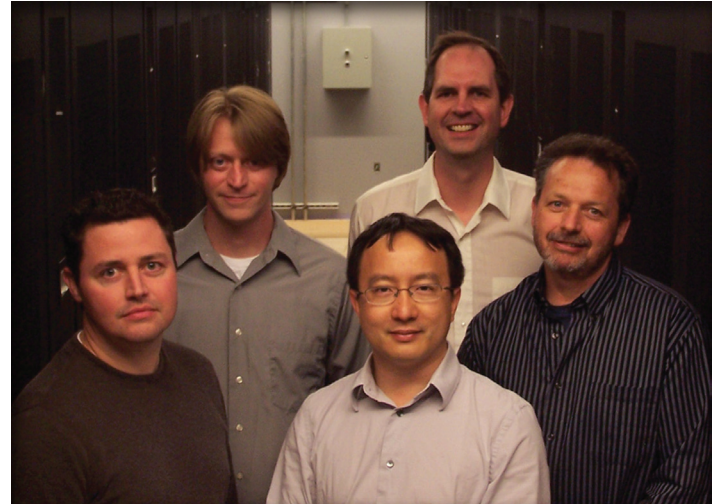
can spend less time managing computational resources and more time conducting scholarly work."

IBM's Shared University Research Award program strives to connect researchers at universities with IBM Research, IBM Life Sciences, IBM Global Services and IBM's development and product labs.

The KU-IBM partnership is developing new hardware and software approaches to modeling and simulations of complex real-world systems. Researchers will be able to process and analyze huge volumes of structured and unstructured data, share their findings, explore new approaches, and store the results of their research. Advanced systems modeling will enable more accurate predictions and large-scale analyses that incorporate data from multiple disciplines into a single framework with the goal of accelerating scientific breakthroughs.

The KU-IBM partnership is developing new hardware and software approaches to modeling and simulations of complex real-world systems.

"We are pleased to help provide KU with the computational framework needed to



ITTC staff and faculty who spearheaded the renovation stand in the Advanced Computing Facility. Front Row: System Administrator Paul Calnon and EECS Associate Professor Jun "Luke" Huan Middle Row: HPC Systems Administrator Charles Henry and RF Electronics Engineer Daniel DePardo Back row: Senior Network System Administrator Michael Hulet

develop and evaluate a hybrid computing cluster that is optimized for a number of simulation paradigms," said Keith Brown, Director of IBM's Strategic University and Industry Alliances.

Gerald Lushington, director of KU's Molecular Graphics and Modeling Laboratory, uses the ACF to extract meaningful data from medical and chemical research.

"Laboratory instruments for studying problems in molecular biology and medicine have grown incredibly sophisticated very quickly, to the point where they produce such huge volumes of useful data that we need very powerful computers to meaningfully analyze data," said Dr. Lushington. "The renovated ACF provides the hardware necessary to do this work." ■

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Thank you for your generous and continued support. Your donations enable student scholarships, special awards for faculty, laboratory upgrades, and other important EECS projects.

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“Three of us locked ourselves in an apartment and spent 100 hours a week for four weeks coding, interviewing soldiers, and reviewing the existing application.”

—Alumnus Michael Swink on the development of DARPA's Tactical Ground Reporting System (TIGR)

Alumni Spotlight

Meet Michael Swink

More than 50,000 American troops in active combat zones are collecting and sharing critical information, pictures, and video through a multimedia reporting tool developed by **Michael Swink** (BSCoE '93 and MSEE '95). DARPA's Tactical Ground Reporting System (TIGR) is a map-based application that allows troops to easily access potentially life-saving intelligence about their surroundings. Mr. Swink and two fellow KU grads created the TIGR software in his Olathe apartment. Over three years, their start-up company, Tactical Blue Laboratories, grew from three people to over 100 employees and contractors before being sold in 2010.



Why would you say KU is the place to earn an excellent EECS education?

For me, it was direct access to high quality KU faculty while working at ITTC as an undergraduate. I think the ability for students to have access to professors, labs, and research projects as undergraduates is as important as the classes themselves. Many schools reserve access to these resources for graduate students and senior-level undergrads, which I think is a great disservice.

What are your favorite KU/EECS memories?

- ◆ Winning the Engineering Open House Rube Goldberg contest with a live snake as part of the machine.
- ◆ Camping outside Allen Field House in the snow with a portable generator for the KU/MU game and having assistant coach Matt Doherty come spend time with us in our tent, providing donuts and \$20 for more generator fuel.
- ◆ Learning what UNIX and computer networks were during my first summer as a systems administrator at ITTC. Remember, this was pre-web. The three-month summer job was the most intense and rapid learning experience of my life (and I love learning new things).

What does a typical work day look like for you?

Pulling two straight all-nighters getting our TIGR software working with new Army radios and then heading into Baghdad with Special Forces. We used our software to coordinate and communicate among MRAPs (Mine-Resistant Ambush Protected tanks) on patrol. After the patrol, we pulled into an Iraqi Army base and helped train their soldiers with AK-47s at the firing range (I was used as a practice student for one of the new Iraqi instructors). The day ended with a more than three hour Blackhawk ride to Camp Adder.

**ok, this was not a typical day, but one of my favorite days.*

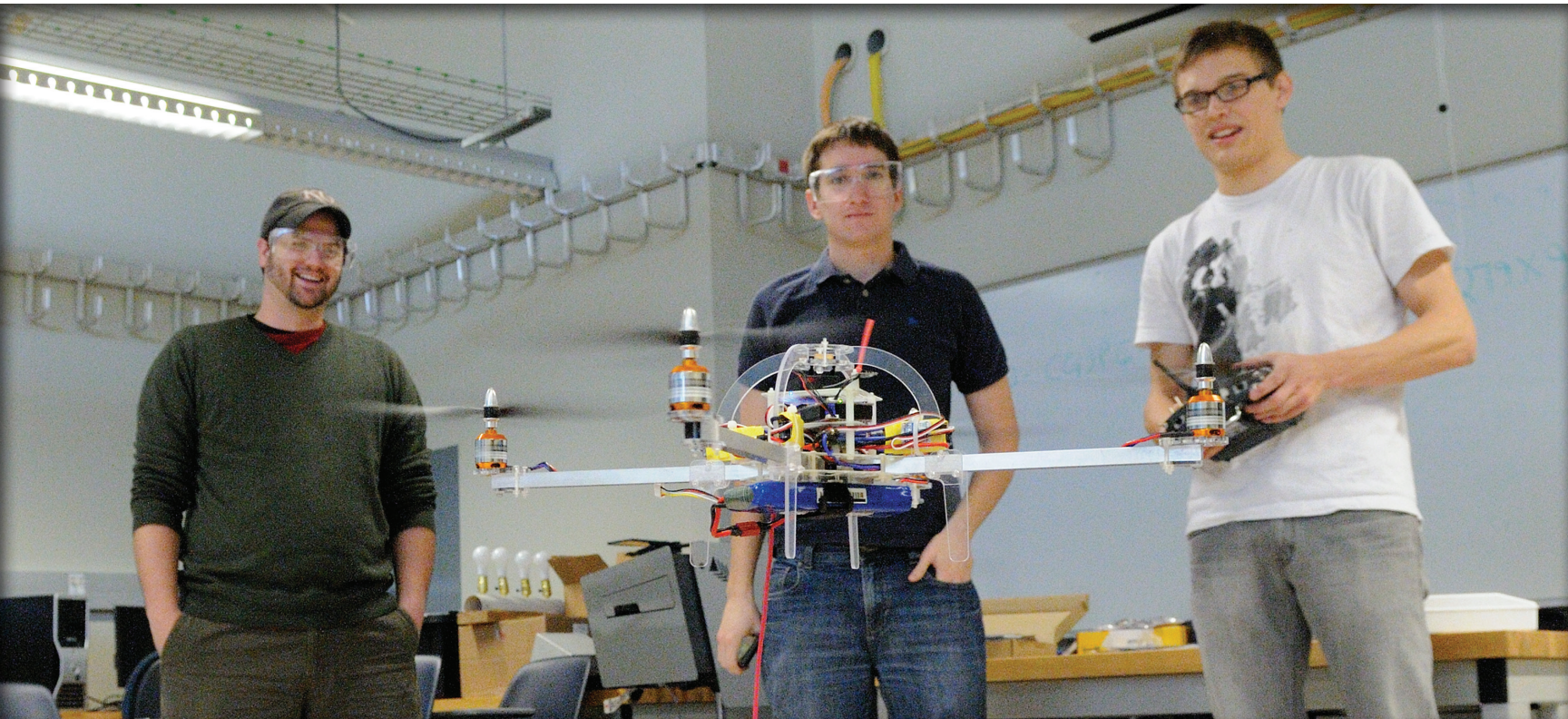
Can you describe a specific work challenge and how you overcame it?

- ◆ DARPA told us that they needed a soldier reporting tool that was a cross between Xbox and MySpace on top of Google maps. They wanted to see a demo in one month to prove that we were the right people for the job. We succeeded by only worrying about the product, not any ancillary business items. Three of us locked ourselves in an apartment and spent 100 hours a week for four weeks coding, interviewing soldiers, and reviewing the existing application. Only after the demo was given, did we stop to get some work/life balance. (As the old saying goes, you only get one chance to make a first impression)
- ◆ Most major problems have been solved by performing the following steps: (1) break down the problem into the parts that we control and the parts we don't (2) prioritize the parts we do control (3) block out all competing issues/distractions and work fanatically to solve the problem. It's not always fun, but I haven't figured out any spectacular shortcuts. ■



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19 Commencement

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10 New Student Orientation Begins
19 Formula SAE Electric

July

21 Project Discovery Camp II

Fall Semester

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High School Design Competition