The last several years have been a period of remarkable growth and change for ECE, and this trend continues. Recently, we added three additional bright young faculty members, formally introduced a new BS degree, and initiated some impressive laboratory upgrades.

In February the new four-year BS degree in Computer Engineering was approved by the Oklahoma Regents. This new degree, replacing the aging computer option, becomes a very important and exciting part of ECE. Approximately half of our incoming freshmen are declaring this new major.

During 2008 we were able to complete a full renovation of our Capstone Design Laboratory in 401ES. This new $200K laboratory is configured to comfortably support all phases of the engineering design process, including research, modeling, fabrication, test, and project review. The new facility, which will be open for the spring 2009 semester, is beautiful and should be appreciated by students, faculty and employers alike.

Our graduate and research program at OSU/Tulsa, focused on nanotechnology and supported by the new Helmerich Advanced Technology Research Center, continues to grow. We have two permanent ECE faculty members there and are anticipating filling several College chaired professorships.

Fall 2009 will be important for ECE as we prepare for our re-accreditation visit by ABET. Our last review in 2003 was very successful. This time around we will request accreditation for both Computer Engineering and Electrical Engineering.

This edition of the ECE Newsletter is filled with information on our past, present and future. Dr. Rama Ramakumar’s extraordinary career is the topic of the featured article, and Dr. Mark Allen, a very successful 1997 PhD graduate, is profiled in On the Shoulders of Giants. I hope you will enjoy these and all the other articles.

As always I sincerely appreciate your support and kind words. I encourage you to consider giving back to ECE. Your support for scholarships, equipment and facilities, student professional development, and other areas is valued and appreciated. Please feel free to contact me if you have questions about how you can contribute to making this excellent program even better. It’s always great to hear from everyone. I wish you all a wonderful holiday season.

Keith A. Teague, Ph.D. PE
Head, School of Electrical and Computer Engineering
Winds of change catching up to Dr. Ramakumar’s vision

America’s Western landscapes, where the sight of a lone windmill once indicated a ranch watering hole or settler’s homestead, are dotted by expansive windmill farms generating electricity to supply the nation’s growing thirst for energy. The proliferation of windmills today signifies progress in the United States, where things old eventually become new and improved. As one of several key, viable solutions to current environmental, energy and economic crises he and other engineers foresaw decades ago, they also stand as testaments to the perseverance of Dr. Rama Ramakumar.

Ramakumar, Regents Professor and PSO/Albrecht Naeter Professor in the School of Electrical and Computer Engineering, began his service at Oklahoma State University 41 years ago as a visiting faculty member and recently celebrated his 51st year in teaching and sharing with scholars his enthusiasm for power and energy engineering. Ever affable and quick with a joke or laugh, he has passionately pursued and advocated renewable, reliable solutions for the world’s energy needs throughout his career, undaunted by shortsightedness and apathy at times from both the world’s citizens and policy makers.

As the third-longest tenured, actively serving faculty member in OSU’s College of Engineering, Architecture and Technology, Ramakumar continues his work, in part to demonstrate that visionaries who aspire to change the world should not stop until they have.

Worldly scholarship

As a young man in India, Ramakumar had early cause to focus on his academic studies. With abilities beyond his years, he advanced quickly and was young and diminutive compared to his peers.

“I didn’t fit in with any of the sports groups at all from high school on down, and during physical education, the teacher would give a football and say, ‘kick this all the way around the field, come back, and you can go home,’” Ramakumar said. “I quickly became interested in other things.”

After beginning his undergraduate studies at the University of Madras as a 15-year-old, he graduated at 19 with a bachelor’s in electrical engineering at the top of his class and completed his master’s in electrical engineering in 1957 at 20 at the Indian Institute of Technology, Kharagpur. Ramakumar had been teaching for two years when he was among a group of scholars sent to the United States for study through the Technical Cooperation Mission Scholars program, a predecessor to U.S. AID.

“There were about 50 people selected from throughout India to come here, get an education and go back
to improve education over there,” Ramakumar said. “Out of these, only four or five of us were chosen for Ph.D. study, and I attended Cornell University.”

“I finished my Ph.D. in 1962 and went back for five years. That was part of the deal,” he said. “It was a very prestigious scholarship that paid everything so I was glad to go back and teach, and I didn’t even know Cornell was an expensive school until I came to OSU.”

In 1967, when Ramakumar was 30, he learned of an up-and-coming energy and power research group that had formed at OSU. Accompanied by his wife, Gokula, whom he’d married upon his return to India from Cornell, he left his native country a second time to join the department that did not yet have “computer” in its title.

“There was some energy research going on here that I was interested in so I sent a letter and my CV to Dr. Bill Hughes,” Ramakumar said. “Nothing happened for a while, but then one day I got a telegram, and they were willing to take me on for a 16-month appointment.”

“I remember the day I arrived and started – Feb. 13, 1967,” he said. “Bill Hughes met us in Tulsa with the university plane, and we flew back to Stillwater after he’d asked the pilot to fly us around to see a little of Tulsa at night. When he dropped us off at the Student Union Hotel, he said, ‘I’ll see you tomorrow at 8 o’clock.’”

Assigned to teach one course and its lab, Ramakumar soon began working with Hughes’ research group in OSU’s School of Electrical Engineering.

**Ahead of the times**

Modern conservation efforts in response to global warming and skyrocketing energy demand and prices was preceded by the environmental movement and oil crunch of the 1970s. In the 1960s, long before terms such as “renewable,” “green” and “sustainable” became commonplace, engineers at OSU were at work on technologies now touted and pursued as possible solutions to today’s global energy crisis.

“People forget that OSU was a pioneer in wind energy. Bill Hughes had the foresight to see alternative energy and energy storage would be extremely important in the future and started this work here in 1961,” Ramakumar said. “By the late 1960s, our group was exploring and talking about how to bring solar, wind, biomass and hydrogen energy and energy storage into the national energy picture,” he said. “I wasn’t a part of it, but there were even some people in the College of Engineering working on a hydrogen burning, internal combustion engine back then.”

Ramakumar continued, “Everybody talks about these things now, and I think, ‘gosh, we were working on this 40 years ago.’ The futuristic outlook we had, to put things together in a way that’s sustainable … we were a little too premature.”

The energy and power engineering group’s groundbreaking development in wind energy and work in related areas led to a textbook and numerous publications and attracted to campus researchers from around the globe, but the triumph was short-lived.

“We always felt wind systems should operate at variable speed and developed a generation system that would take variable speed of the wind and continues
produce a constant frequency with a special generator combined with power electronics,” Ramakumar said. “We had two variable speed systems operating with our generator at Stillwater Airport, and it led to a lot of publicity for the department and OSU. I remember people from Europe came and looked at it.”

“But at about the same time, the federal government insisted that constant speed was the way to go, even though wind is not constant, and they had the money,” he said.

The Energy Research and Development Administration mandated that all wind generation systems supporting the national grid be constant speed, effectively ending the group’s federal and private funding. The move also proved costly for the nation as all constant-speed windmill generation systems, constructed from Ohio to New Mexico after an investment of millions of dollars, broke down soon after going into operation.

“Now, almost all windmills are variable speed, and if you’ve got to pinpoint one thing that makes wind energy so economical and practical today, it’s that most of the systems are operated at variable speed,” Ramakumar said. “Except for those who go back and refer to the work we published, nobody remembers we advocated that 40 years ago, but that’s life.”

Still going strong
While discouraging, the demise of the wind power research and development work did not deter the energy and power group. Outreach by the Engineering Energy Lab Ramakumar continues today includes the Frontiers of Power Conference, one of the most enduring industry confabs presented by OSU.

“Bill Hughes started it as the Energy Conversion and Storage Conference, and eventually it became the Frontiers of Power Technology Conference and, then, the Frontiers of Power,” Ramakumar said. “He conducted 19 of the conferences before he retired in 1987, and I took over for the 20th and have conducted it since.

“The local power companies – OG&E, PSO, AEP, Oklahoma Municipal Power Authority – deserve a lot of recognition for providing support over a long period of time that has helped us sustain this program,” he said.

In October 2007, upon its 40th anniversary, Ramakumar was presented a special commendation from then-interim OSU President Marlene Strathe for his direction of the Frontiers of Power Conference. It remains a prescient and relevant forum where professionals and researchers involved in electric power generation, transmission and distribution as well as utility company and government representatives gather to discuss critical problem areas of power technology, including technical, economic and political issues.

In recent years, the conference has focused on concerns from reliability and distributed generation challenges to incorporation of renewables into grid systems and critical shortages in the power engineering workforce. “One thing we’ve done is start an endowed scholarship program in Bill Hughes’ honor in 1992 and over the years given 30 scholarships to encourage students in this area,” Ramakumar said. “There’s more glamour in other areas – lasers, computer gadgets, optics – and I’m not saying they aren’t important, but so many more people are going that way, it has depleted the power area.”

Influenced by his experiences as a TCM Scholar, Ramakumar actively maintains the Engineering Energy Laboratory’s global outreach, touting the merits of renewable solutions for energy demand in emerging nations worldwide and his knowledge-based Integrated Renewable Energy Systems concept, or IRES-KB.

“I’ve always felt that autonomous, renewable systems designed to utilize locally available resources is the way to provide energy in remote, rural areas of developing countries, and we gave a presentation on this in Washington, D.C., in 1969,” Ramakumar said. “As a consequence of all these things we’ve done over the years in wind energy modeling and reliability studies, we came up with the concept of IRES.”

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Developed by Ramakumar and graduate students under his tutelage, the computer program IRES-KB supports the design of area-specific power systems for people of nations that do not have the United States’ financial resources.

“Essentially, you consider what you have – sunlight, availability of wind, biomass – and what you need, input the information and come up with a preliminary design of a system that can be hooked up to local power lines or operated autonomously to meet all energy and other needs,” Ramakumar said. “In some places it may make more sense to burn biomass directly for heat and cooking than for generating electricity. You might want to determine the needed size of a wind, hydro or solar system, or how much energy storage is required.”

“Instead of rural ‘electrification,’ we like to say it’s about ‘energization’ because the main object of IRES is to decrease cost and increase efficient use of all energy resources available locally to people in developing countries,” he said.

In the past two years, Ramakumar has presented papers on IRES-KB at conferences in China as well as Thailand, though the program has yet to be widely adopted.

“The thing about the energy field is a lot of people talk about it, but when it comes down to putting serious money into potential solutions, most people find other priorities,” Ramakumar said. “We’re still hoping IRES can catch on sometime, someday.”

**Living Legacy**

Drs. Jack Allison, Claude Summers, Ken McCollom and Dan Lingelbach, once his colleagues in the energy and power research group, have long since retired, and his friend and mentor Bill Hughes passed away in 2007, but Ramakumar remains committed to furthering the work they began together more than 40 years ago. Today, Ramakumar and Thomas Gedra are the School of Electrical and Computer Engineering’s only power and energy engineering faculty specialists, but Ramakumar interacts with all graduate students in the department.

After twice serving as interim department head and advising 13 Ph.D. students and countless master’s students over the past 41 years, he was named graduate coordinator in 1993. “They can’t avoid me now,” he said, with a laugh.

Over his career, Ramakumar has authored and co-authored nearly 200 publications, including the textbook, “Engineering Reliability: Fundamentals and Applications,” that has been adopted by more than 20 universities around the world. His most satisfying and humbling professional recognitions include being named an IEEE Fellow in 1994, for contributions to renewable energy systems and leadership in power engineering education, and OSU teaching honors such as the Burlington Northern Award and the CEAT’s Halliburton Award.

Ramakumar is happiest and more at ease talking about the achievements of his offspring. He and Gokula have a daughter, Malini, and a son, Sanjay, and six grandchildren.

“Malini is an OSU mechanical engineering graduate, and she’s married to Randy Bartels, an OSU electrical engineering graduate who is now on the faculty at Colorado State University,” Ramakumar said. “Sanjay went into a six-year undergraduate and M.D. program at the University of Missouri–Kansas City right out of high school, and after a six-year residency at the Mayo Clinic and a one-year fellowship at Johns Hopkins, he went to the University of Arizona as a faculty member.

“He’s now in private practice with a group in Tucson, where he lives with his wife, Sridevi, and children,” he said.

*continued on page 17*
Electrical Engineering has long been a strong college major within many Universities across the United States. However, the development of the study of engineering as a science has had a long and winding road. Although James Clerk Maxwell, Nikola Tesla, and Thomas Edison provided strong examples of people who can achieve wonderful accomplishments through the study of electricity, many scientists of the times who wanted to study engineering had to fight for an independent curriculum that was well-respected by others similar to the natural sciences, such as Chemistry and Physics.

Electricity, Tesla Coils, and other marvels of the time were strong examples to convince others that the study of Electrical Science or Electrical Engineering was a prudent one. However, it took several years for many in the industry to be convinced that engineering sciences could be taught differently than what was offered through natural sciences. For example, Oliver Heaviside has long been credited with adapting complex numbers to the study of electrical circuits. Unfortunately, many scientists of the times accused him of being mad and his impact upon the area of Electrical Engineering and Physics was delayed until long after his death in 1925.

Oklahoma State University has had a long history, since its inception in 1890, of establishing strong programs in Science, Technology and Engineering. The Electrical Engineering department was one of the first departments in Engineering on OSU’s Stillwater campus along with Mechanical and Civil Engineering and was officially designated as a separate department in 1909. The mission of the department has long been associated with the ideals of a land-grant university in proudly serving the great state of Oklahoma. More importantly, Electrical Engineering has and still maintains strong ties to Oklahoma and the nation in providing strong and successful alumni. Although the program at Oklahoma State University provides quality instruction and research in the areas of Electrical Engineering its association, since 1936, with the Accreditation Board of Engineering and Technology (ABET) helped structure its program to conform to standards in producing quality graduates. This proud association with ABET and the university’s dedication by its administration, faculty and staff in providing a strong and vibrant program is an important factor for all its students and alumni.

In 2005, I joined Oklahoma State University when I was hired as a faculty member in the School of Electrical and Computer Engineering (ECE). At the time, the importance of my hire was to highlight the area of computer engineering. Computer Engineering or Computer System Engineering is a branch of Electrical Engineering that encompasses areas of computer science and electrical engineering specifically targeted at areas related to computer interaction. Although Computer Engineering was originally similar to other divisions within Electrical Engineering, such as communications, it has grown quite dramatically to be classified as a separate degree program within Engineering. In fact, ABET started accrediting Computer Engineering programs in 1971 and today it continues to be one of the more popular degree programs in the United States. According to the American Society for Engineering Education (ASEE), both electrical and computer engineering degrees still remain one of the most popular engineering disciplines at the undergraduate level.

The ECE department within the College of Engineering, Architecture and Technology at Oklahoma State University, once only labeled as an Electrical Engineering department, now is molded as an amalgam of two departments housing both Electrical Engineering and Computer Engineering disciplines.

Since 2005, ABET is now considered ABET, Inc. instead of an acronym to allow its organization to reflect its broadening areas of technical education.
Although Computer Engineering is a vibrant and exiting program within the University, it still did not have its own degree program when I joined the department. The Computer Engineering option was the only avenue in which a student could specialize in Computer Engineering through an Electrical Engineering degree. Consequently, it was important that we worked with the administration and faculty within Oklahoma State University to create an accredited Bachelor’s Degree program in Computer Engineering. After many long hours of work and help from many within and outside the University, Oklahoma State University now officially has a Bachelor of Science degree in Computer Engineering.

Oklahoma State University is undertaking important strides by reinvigorating the university by undertaking new educational programs and research, as well as help from its wonderful graduates. Recently, T. Boone Pickens and many of its alumni have been successful at reinvesting in OSU’s future by generously donating many millions of dollars to help strengthen its academic program. Since joining the department in 2005 and with the inception of a new Bachelor’s degree program in Computer Engineering, the department has also hired several new faculty within the computer engineering disciplines. In fact, since 2005, computer engineering faculty have been able to acquire research funding close to 1 million dollars as well as starting many new and vibrant educational programs to strengthen and embolden graduates of this wonderful University.

The future of both Electrical and Computer Engineering looks bright with the introduction of new programs and additional faculty, however, the department still believes that more is yet to come. In today’s society, many of these successes will be realized with technological advances and innovation from its alumni, current students, and faculty. The Computer Engineering Bachelor’s degree is just one of the many new items associated with our department. Although many long hours were invested in obtaining this new engineering degree, it comes with less criticism as those realized by Oliver Heaviside when introducing complex numbers to electrical circuits. Fortunately, in today’s society and with the strength and support of all within the department both new and old, we are less likely to be accused of being mad when introducing something new.

James E. Stine
While the enticement of outstanding starting salaries upon completion of an electrical engineering bachelor’s degree is strong, graduate study and the additional training it supports are useful preparation for employment in the private sector.

If, like Eric Larson, a student has aspirations to serve in academia, the research opportunities and applicable coursework offered within School of Electrical and Computer Engineering graduate programs are essential.

Larson graduated summa cum laude from OSU in December 2006 with his bachelor’s in electrical engineering emphasizing communications, systems and controls. He opted to remain at OSU for his master’s degree.

“It’s always important to have as much academic experience and know as much about what you are doing as possible before you go into the workplace,” Larson said.

As part of his study toward a master’s in electrical engineering with an emphasis on image processing, he has worked as a research assistant under Dr. Damon Chandler in the school’s Vision and Signal Processing Lab.

Image fidelity, region of interest, facial feature tracking and animal camouflage are some of the lab’s interests on which Larson has done research.

“All the problems that we are trying to solve, biology has already solved,” Larson said. “What we do is to try out biologically motivated strategies to solve our own problems.”

Larson said his time as a graduate student has greatly supplemented his education in the school, making him much more well-rounded as an engineer.

“I think I have gotten a varied exposure,” Larson said. “I never thought I would be studying the human vision system or evolutionary ecology in engineering.”

“Grad school has helped me specialize in things I am most interested in, but I don’t feel like it was a narrowing degree,” he said. “I feel like grad school is more broadening.”

Larson received his master’s degree in July. He was accepted and began his doctoral study at the University of Washington this fall.

After Larson completes his Ph.D. in electrical engineering, he hopes to return to the Midwest and continue research in image processing as a professor.

As a sophomore, Larson served as a teaching assistant and fell in love with teaching.

“I like finding ways to make things interesting,” Larson said. “Finding ways to morph a course into something that people will enjoy and understand is absolutely necessary. I think I understand that, and I want to do it.”

Larson’s professional journey has only begun, but he does not hesitate to offer advice to engineering scholars considering graduate study.

“I would say that grad school is now more important than ever,” Larson said. “It gives you that much needed edge in a field as competitive as engineering.”

“It has made me feel much more confident about what I am doing.”

Wes Burt

“It’s always important to have as much academic experience and know as much about what you are doing as possible before you go into the workplace.”

Vitals

**Eric Larson**

**Hometown** Tulsa, OK  
**Date of Birth** August 6, 1983  
**Family** Mother, Brenda; older sister, Aja  
**Currently working** on Ph.D. in electrical engineering at the University of Washington  
**Future ambitions** Become a professor at a university in the Midwest  
**Research Interests** Image Processing  
**Hobbies** Playing guitar, brewing beer. Anything but electronics!
nprecedented, international demand today for engineers and technically-skilled professionals has made it possible for Oklahoma State University’s School of Electrical and Computer Engineering graduates to be more discerning than ever in fielding offers from prospective employers. For some, like Cameron Musgrove, a degree from OSU was a ticket to a dream job. Musgrove, who graduated with his master’s degree in December 2007, landed a position with Sandia National Laboratories in Albuquerque, New Mexico. The premier developer of technology solutions to national and global threats to peace and freedom, the government-owned/contractor operated (GOCO) facility is managed by Sandia Corporation, a Lockheed Martin company, for the U.S. Department of Energy’s National Nuclear Security Administration.

It is also a place where Musgrove aspired to work before opting to study electrical engineering at OSU. “I chose to major in electrical engineering because I’ve always been interested in electronic equipment,” Musgrove said. “I decided to come to Oklahoma State because I knew it had an exceptional engineering program and a lot of other opportunities for me.”

Musgrove works in Sandia’s Synthetic Aperture Radar Applications department that creates high resolution images of terrain with minimum constraints on time-of-day and atmospheric conditions. “Sandia is a world leader in Synthetic Aperture Radar. I play a system analysis role for various projects and research solutions to problems using simulation and testing,” Musgrove said. While at OSU, Musgrove did his master’s thesis work under Dr. Daqing Piao in the School of Electrical and Computer Engineering’s Optical Imaging Laboratory. Research in the lab focused on minimally-invasive multimodality functional imaging for cancer detection in the prostate. Musgrove’s project focused on a new way to image prostate cancer using infrared light. “I ran simulations and created new simulations,” Musgrove said. “I also studied how infrared light propagates through the body and how it moves through the human tissue.”

Musgrove also worked for Dr. Charles Bunting on “Engineering Students for the 21st Century,” the National Science Foundation-funded project the school is heading. Its goal is the development of engineering education innovations that will markedly improve student retention and graduation rates, and better prepare them for success in the profession. “For this grant, I worked to redesign the structure of ENSC 2613, Introduction to Electrical Science, to increase the depth of student learning,” Musgrove said.

Musgrove attributes his success today to such experiences, as well as his coursework, at OSU. “The classes at Oklahoma State gave me a good overview of a lot of different things,” he said. “I gained vital fundamentals for me to build on in order to learn the niche knowledge for radar systems.”

While at OSU, Musgrove earned scholarships such as the Naeter HKN Electrical Engineering Scholarship and the OSU Regents Distinguished Scholarship. He also served as president of OSU’s student chapter of the Institute of Electrical and Electronic Engineers (IEEE). “Being the president of IEEE helped me get over a lot of public speaking fears,” he said. “It also helped me learn how to be organized, which helped me in graduate school and in my job.”

continued on page 17


Grants and Contracts


Grischkowsky, Daniel R. $175,000. Two Dimensional THz Photonics and Waveguide THz-TDS. National Science Foundation.

Fan, Guoliang $12,000. Research Experiences for Undergraduates (REU) Supplement. National Science Foundation.


Hutchens, Chris G. $27,000. Micro-Neural Interface. University of Oklahoma for the Oklahoma Center for the Advancement of Science and Technology.


Piao, Daqing $45,000. Video-rate Endoscopic NIR Tomography of Hemodynamics. Oklahoma Center for the Advancement of Science and Technology.


Sheng, Weihua $2,500. Big 12 Faculty Fellowship. Oklahoma State University.

Sheng, Weihua $1,000. Microsoft Hardware Grant, Microsoft Inc.


Teague, Keith and Scheets, George $74,000. Next Generation Secure Multimedia Wireless Communication Research. Smartronix, Inc. for the Naval Research Laboratory.

West, James C. $16,500. AFOSR/ASEE Summer Faculty Fellowship, Air Force Research Laboratory.

Eta Kappa Nu (HKN) is the honors society for Electrical and Computer Engineering (ECE) students. The HKN was founded in 1904 at the University of Illinois. The purpose of HKN is to recognize students who have achieved academic excellence in their college careers and to provide leadership experiences to help them succeed professionally.

OSU’s Omega Chapter is active throughout the school year. During the fall semester, we invited two of our new ECE professors to speak about their research at the monthly meetings. In the same semester we had an event called ECE Gameday where teams of students led by professors participated in a quiz game called Jeopardee! The two E’s at the end stood for “Electrical Engineering.” The Final Jeopardee! Round involved Dr. Teague and Dr. Latino bashing each other in “Wii Sports: Boxing.” Dr. Teague went on to win the grueling match for his team by eventually knocking Dr. Latino out.

This year’s Eta Kappa Nu banquet was held in the Student Union’s Sequoyah Room. The banquet was preceded by the annual induction ceremony for new members. The banquet itself was formal, yet relaxed, as every table competed in a riddle game.

Our future events for the spring semester include community service projects and the Electron Bowl. The Electron Bowl is a bowling competition between IEEE and HKN. The winner holds the Electron Bowl trophy until the next competition.

The HKN Chapter at OSU focuses on enriching the college experience for students in this challenging major. HKN offers free tutoring for all electrical/computer engineering and math courses and hosts review sessions for ECE exams. Events such as ECE Gameday make it easier for students and professors to develop personal relationships. The Omega Chapter is looking forward to making a difference in the ECE community and the Stillwater community in the upcoming semester.

Jeremy Pearson
Recording Secretary
OSU HKN Omega Chapter
Contact: jeremy.pearson@okstate.edu
The OSU student chapter of the Institute of Electrical and Electronic Engineers is a professional organization that endeavors at providing students with exposure to resources and engineering opportunities. The organization offers many tools to students, including information on the electrical engineering industry, significant issues related to engineering, internship opportunities, and full-time job opportunities. In addition, the monthly meetings provide a chance for ECE students to gather together and learn about the industry through corporate presentations, also allowing for a chance to expand the leadership skills among its members. This year’s speakers included Lockheed Martin, Conoco Phillips, Halliburton, Boeing and Zeeco, among others.

In addition to the monthly meetings, IEEE OSU hosts several other events. September brings the Fall Picnic, giving students a chance to meet new friends, play frisbee and grill hamburgers on Library Lawn. Every spring, IEEE OSU participates in The Big Event, a campus-wide volunteer day, to reach out to the Stillwater community. In April, the Spring Banquet provides a chance for students and faculty to reflect on the year and recognize significant people and accomplishments within OSU ECE. This year’s speaker was Dr. Jim Lansford, OSU alum and Chief Technology Advisor at Alereon, a semiconductor company located in Austin, Texas, specializing in Ultrawideband (UWB) technology. He is an expert in the field of communications system analysis and design, and gave an inspiring and informative presentation about his involvement in the growth of Alereon and the transition from college to career.

IEEE OSU continues to be a driving force within the School’s Electrical and Computer Engineering, providing resources and information to empower students and faculty with the resources and tools necessary to impact today’s world, both on the campus of OSU and the world at large.

Sarah VanCamp
IEEE OSU President, 2007–2008
he rise and fall of the telecommunications sector at the turn of the century is a cautionary tale, especially among investors who bet on technologies they did not fully grasp, with little sober analysis of actual market demand. The innovators, such as Dr. Mark Allen, recall telecom’s first golden, post-deregulation era pensively, in Dickensian terms: “It was the best of times. It was the worst of times.”

“If there’s a narrative, or theme, for my career, it’s that I got into telecom on the ground floor, it really started to grow and was booming, and then everything fell apart,” Allen said.

“But the industry has come back strong and been very good the past five or six years,” he said. “I was fortunate enough to join Infinera just as the recovery was beginning 4 or 5 years ago, we have been very successful so far.”

As director of System Engineering for Infinera Corporation, Allen serves as one of the company’s primary technical sales interfaces pursuing new business with new and existing customers, including AT&T, Verizon and others. He brings to the position engineering expertise as a network architect and planner as well as the entrepreneurial experience of launching telecom startups.

Witnessing firsthand the ups and downs of the industry the past two decades, Allen possesses a unique perspective on telecom’s recent past that he applies in constructing its future.

Lighting the way

Allen, a native of Liberal, Kan., completed his bachelor’s degree in electrical engineering at the University of Kansas in 1990. He began his career as a network engineer with Williams Communications, where the first WilTel network was being developed.

“While building out the network, we had the opportunity to participate in a rotation program that let you rotate through different jobs – engineering, operations, planning – to learn the telecom business,” Allen said. “It was a special deal that Williams offered, and those of us who were fortunate enough to experience it have almost become a sort of little alumni group in the industry.”

Eventually sold to upstart provider LDDS WorldCom and today a part of Verizon’s backbone network, the WilTel network signaled the coming, new era of telecommunications.

“Telecom had begun to change dramatically, beginning with the break-up of AT&T in 1984, and phone carriers like MCI and Sprint who’d been doing battle with ‘Ma Bell’ suddenly felt like they could be competitive,” Allen said. “Williams’ plan was to build and sell wholesale bandwidth to these other providers.”

“We were all non-legacy folks trying to build something new,” he said.

Allen’s initiation included work to improve the performance and reliability of Frame Relay communication networks and long haul Fiber Optic Transmission Systems (FOTS), multiplexers and telemetry systems. He also served as a field engineer and developed architecture for a variety of data, voice and transport network reconfigurations.
Although already married to his wife, Annie, he also found time to return to school, choosing Oklahoma State University for his graduate work. While working at Wiltel, Allen completed his master’s degree under the tutelage of Dr. George Scheets in the School of Electrical and Computer Engineering. He decided also to pursue a Ph.D., again with Scheets as his adviser.

“George was a great teacher who ended up becoming a mentor to me,” Allen said. “I was a big fan of the way he taught and how he asked you to look towards the practical aspects of things.”

Inspired by memories of his educational experience at OSU, and eager to help students with aspirations in the telecom industry, Allen this year funded the Allen Communications Engineering Scholarship. Beginning in the fall, his gift to the School of Electrical and Computer Engineering will be used to fund annual, $5,000 awards for two graduate students in telecommunications and networking.

“I was married while I finished my Ph.D. at OSU, and we had our first baby during our time in Stillwater in 1994,” Allen said. “I’d received a fellowship at that time and was very appreciative of it. It seemed only fair to give a little back.

“The financial assistance from OSU during that time, made getting a Ph.D. while married and having children easier, and I’m grateful for that.”

**Clear signal**

According to Allen, the World Wide Web was still a novelty when he started at Williams, but that was changing rapidly by the time he began his Ph.D. study.

“With the Internet beginning to take off, Wiltel – which became WorldCom – was trying to start planning special services related to the growth of networks,” Allen said. “George and I presented a proposal to them and were able to source some funding so I ended up with industry-sponsored research for my Ph.D. project.”

Titled “Trunk Sizing in Packet Networks – The Effect on User Quality of Service,” Allen’s dissertation detailed the software tool he created for LDDS WorldCom, then the nation’s largest provider of Frame Relay and Asynchronous Transfer Module Wide Area Network (ATM WAN) connectivity.

The tool included discrete event simulations and queuing models and simulated Open Shortest Path First (OSPF) routing. In addition to describing data traffic, the end product provided WorldCom network engineers and operators models to predict quality of service of the packet network as more customers were added.

“The thing I liked about what I was able to do at OSU is, I got a little industry experience and then came back and was able to tailor my studies around what I’d done at Williams,” Allen said. “Everything I did, even with the Ph.D., I considered to be practical.”

**The sound and the fury**

When he finished his Ph.D. in 1997, Allen worked briefly at Raytheon E-Systems before returning to Williams. A non-compete agreement the company signed upon selling WorldCom the first WilTel network had expired and development had begun on a second. Allen was almost immediately promoted to director of network architecture and spent two years helping direct the build out of the new 30,000-mile, long-haul metro optical/transport network.

The multi-billion-dollar project gave Allen his first taste of telecom entrepreneurship. He managed the features, functionality and price points for technology vendors, and worked closely with WilTel’s capacity planning, information technology, marketing and implementation groups to ensure network topology matched services being sold. In addition, Allen started the migration of Williams’ broadcast quality video network from DS3 to an on-demand, IP/ATM network, saving millions annually in transport costs that could be freed and resold to external customers.

In 1999, Allen left Williams and followed his interests to San Jose, Calif., where he co-founded Valiant Networks Inc. to offer outsource network operations, testing and certification support services to equipment manufacturers and telecom service providers.

“I’d gotten plugged in with some entrepreneurial guys and had the opportunity to do a startup in California,” Allen said. “I liked the experience of being a part of these projects people enjoy and allow them to connect. Kleiner Perkins, one of the premier venture capital firms in the world, offered to fund our project. During that time, they were involved in many of the other successful start-ups in the communications field.”

“I’d also found I liked the aspects of working with smaller and smaller companies,” he said. “You could grab onto whatever job needed to be done, and it felt like you could make a real impact.”

Valiant grew to 100 employees and achieved more than $5 million in revenues in its first few months. Its success was short-lived, however, much like AOptix Technologies, the Campbell, Calif., startup Allen joined as director.
of applications engineering in 2002. By that time, the bottom had fallen out of the telecom sector, and an achievement such as the nation's first all-optical, free-space optics (FSO) system capable of delivering more than 10 gigabits per second could not keep AOptix afloat.

“Valiant wasn’t terribly successful, and AOptix just wasn’t successful,” Allen said. “When the Internet bubble burst, the telecom bubble started to burst in a big way, and it got pretty ugly in 2001 and 2002.

“We went from doing great business to a complete meltdown,” he said. “The problem was that our customers, the emerging competitive phone companies, or CLECs as they are called, began to fail rapidly in the 2001 timeframe, and this had a ripple effect throughout the industry.”

The effects of the national economic downturn following 9/11 did not last long in most industry sectors. Telecom, however, already was beset by eroding confidence, overinvestment and the realization many new technologies and service offerings could not generate revenues as expected.

“It’s interesting to see this housing downturn and subprime mortgage in the news now because people are talking about recession, but from my experience in the telecom meltdown, I learned that how a recession affects you is highly dependent on where you are and what you’re doing” Allen said.

“Around 2004, we’d see and hear on the news that the technology sector was recovering, but we couldn’t tell it,” he said. “A lot of people just left telecom for other fields. Colleagues went into selling insurance, real estate.”

Back in business
In 2002, the Allen household had grown to include daughters Katherine and Sarah so the family moved back to the Midwest to be closer to relatives in Kansas. Allen set up his own consultancy, SignalWise LLC, in Allen, Texas. While working with tech startups at a business incubator in the area, Allen dabbled in the design and development of network models and other software. He also took a post as an adjunct professor at Southern Methodist University.

“I taught at OSU-Tulsa when I went back to Williams the second time, at San Jose State when we went out to California, and at SMU when we moved to Texas,” Allen said.

“I remember the first few times I went in trying to teach undergraduate classes at OSU-Tulsa and wasn’t totally prepared,” he said. “It gave me a newfound respect for my professors and was more challenging than I thought, but I’ve enjoyed it to the extent it’s something I’ve tried to continue to do.”

Allen added, “I would do it now, but my schedule doesn’t allow it.”

Since he joined the Sunnyvale, Calif., company in 2004, Allen has played in instrumental role in the growth of Infinera and its international business. In many ways, his work as System Engineering director is the most likely culmination of his previous experiences.

“The kind of work we do, the multi-million-dollar sales of our kind of equipment to network operators, is probably one of the longest, most complicated sales cycles,” Allen said. “We work with big companies and help them model our equipment in their networks. We show them how it fits into their network, and we may be a year or two into the sales cycle before we know they’re going to buy.”

“The great thing about these kinds of roles, though, is you get to do technical things but you’re out there working with and talking to people,” he said. “It’s a nice job that’s a great combination of sales and engineering.”

According to Allen, the telecom business is again booming, this time with a financial forecast based on realities of the market.

“Infinera has had a lot of success in the United States and has customers in Asia and Europe, but now we’re focused on Latin America where there is going to be really high demand for customer bandwidth in places like Argentina, Brazil and Mexico,” he said.

“We’re seeing growth now that’s sustained by real demand — videos, movies and music on the Internet — also user created content like YouTube — and those things. The 3G and WiMax and other high bandwidth wireless mobile devices are also driving more traffic on the networks. All this adds up to more demand for advanced networking equipment.”

The future of telecom looks bright, and Mark Allen continues to play an active part in this exciting industry.

Adam Huffer
For Musgrove, the biggest difference between work and school is that projects last more than a semester. He and fellow recent OSU graduate Justin Ford are the latest in a long line from the School of Electrical and Computer Engineering hired to put to use at Sandia the knowledge and skills they acquired in Stillwater.

“At work you really get to see the results of what you’ve done,” Musgrove said. “I enjoy getting to build something and see it working and being applied.”

“IT is so important for engineering students to work hard for what you want and try new things,” he said. “I was constantly on the lookout for what job I wanted, and I was rewarded by finding a place where I’m always going to learn and get to do something new.”

Katie Butler
Dr. Grischkowsky’s paper is one of the 50 Most-Cited JOSA Articles within the past 90 years!

This paper introduced the method of THz Time-Domain Spectroscopy (THz-TDS) by a series of precise measurements on dielectrics and semiconductors. For THz-TDS, two electromagnetic pulseshapes are measured, the input pulse and the sample pulse, having changed shape due to its passage through the sample under study. Consequently, by Fourier analysis of the input and sample pulses, the frequency dependent absorption and dispersion of the sample are obtained. The THz-TDS spectrometer introduced and used in this paper has become the basic THz-TDS spectrometer used world-wide today.

The full citation of this paper is:


Currently this paper has 378 citations in the Citation Index of the ISI Web of Science, and is one of the 50 Most-Cited JOSA Articles within the past 90 years!

Contribution from American Electric Power/Public Service Company

Harry Gordon, (right) Vice President, Distribution Region Operations with American Electric Power, presents a check for ongoing support by American Electric Power/Public Service Company of Oklahoma, to Dr. R. Ramakumar (center), PSO/Albrecht Naeter Professor and Director of the Engineering Energy Laboratory and Dr. Keith Teague, Head of ECE (left). AEP’s annual support of the Engineering Energy Laboratory helps fund research in the field of electric power engineering and educational conferences, such as the Frontiers of Power Conference, convened the 40th Anniversary event on October 29 and 30, 2007.
**Dr. Gary Yen is elected as the President of IEEE Computational Intelligence Society**

On June 1, 2008, the Computational Intelligence Society (CIS) of the Institute of Electrical and Electronics Engineers, Inc. (IEEE) met to elect its new officers to lead the society. IEEE is the world’s largest professional organization with 375,000 members worldwide. CIS, one of 38 technical societies, with 6,500 members is devoted to promote all computational and theoretical aspects of mimicking nature for problem solving. Professor Gary G. Yen from the School of Electrical and Computer Engineering has been elected to serve as CIS President Elect in 2009 and President in 2010-2011.

Before joining OSU in 1997, Dr. Yen was with the Structure Control Division, U.S. Air Force Research Laboratory in Albuquerque, New Mexico. His research at OSU has been supported by the DoD, DoE, EPA, NASA, NSF, and a Process Industry Consortium. His research interests include intelligent control, computational intelligence, conditional health monitoring, complex network, signal processing and their industrial/defense applications. Dr. Yen chaired the 2006 IEEE World Congress on Computational Intelligence held in Vancouver, Canada in which over 1500 attendees participating the event. He is the founding editor-in-chief of the IEEE Computational Intelligence Magazine since 2006. He has published two books, 16 book chapters, 65 peer-reviewed journal articles and over 120 conference papers.

Congratulations, Dr. Yen!

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**Dr. West was honored with ECE Outstanding Professor of the Year**

Eta Kappa Nu (HKN) is the honors society for Electrical and Computer Engineering. This year’s Eta Kappa Nu banquet was held in the Student Union’s Sequoyah Room. The banquet was preceded by the annual induction ceremony for new members. At the end, Dr. West was announced the ECE Outstanding Professor of the Year. The award is determined by a student vote, and the students complimented Dr. West for his dedicated teaching and being very helpful to the students.
Dr. Ramakumar Honored in the Annual Frontiers of Power Conference

Dr. Rama Ramakumar (left), PSO/Albrecht Naeter Professor of Electrical and Computer Engineering was recognized recently on the occasion of the 40th Annual Frontiers of Power Conference held at Oklahoma State University. Dr. Ramakumar, Director of the Engineering Energy Laboratory, has been the organizer and chairman of the conference for many years. The conference has a long and distinguished history of serving professionals in the energy and power industry in the U.S. A plaque commemorating Dr. Ramakumar’s longstanding service and commitment to the conference and his profession was presented by Dr. Marlene Strathe, OSU Interim System CEO, President and Provost, Dr.

Karl Reid, Dean of the College of Engineering, Architecture and Technology, and Dr. Keith Teague (right), Head of the School of Electrical and Computer Engineering at OSU.

Professor D. R. Grischkowsky Awarded Honorary Professor of Tianjin University

Professor D. R. Grischkowsky from Oklahoma State University was awarded an honorary professorship at Tianjin University on April 10, 2008. President Gong Ke met with Professor Grischkowsky. Discussions were made on collaboration between TU and OSU in the field of Terahertz Waves. Professor Grischkowsky said he would come to TU at least once a year to help advance the research on Terahertz Waves there. During his stay at TU, Professor Grischkowsky attended the 4th International Symposium on Ultrafast Phenomena & Terahertz Waves and gave a keynote speech. Professor D. R. Grischkowsky has published more than 140 refereed journal articles in his career. His work is internationally respected and very widely cited, and he is well known as an active leader and scholar in the field of ultrafast nonlinear optics and terahertz radiation. Dr. Grischkowsky has been elected to Fellow status in three professional societies (American Physical Society, Optical Society of America, and Institute of Electrical and Electronics Engineers), and has won three prestigious international scientific prizes, including the Boris Pregel Award for Applied Science and Technology, from the New York Academy of Sciences, the R. W. Wood Prize, from the Optical Society of America, and in 2003 the William F. Meggers Award, from the Optical Society of America.
**ECE Welcomes Three New Faculty Members**

**DARYOOSH NAZANIN**

Dr. Daryoosh Vashaee joined OSU in 2007 after a postdoctoral research experience on nano energy materials at MIT. He received his Ph.D. on nano-scale charge and energy transport in electrical engineering from the University of California at Santa Cruz (UCSC) in 2004. Prior to UCSC, he earned his BS and MS both in electrical engineering from Sharif and Amirkabir University of Technology, Tehran in 1993 and 1995 respectively. After three years of experience working on RF Engineering, Daryoosh joined UC-Santa Barbara and worked on the fabrication and processing of thin film thermoelectric devices. His research interests are on theoretical and experimental investigation of energy materials and devices, nano and micro-scale charge and energy transport, thermoelectric/thermionic energy conversion, and integrated micro-refrigeration.

**DR. DARYOOSH VASHAEE**

**Dr. Nazanin Rahnavard** received her B.S. and M.S. degrees in electrical engineering from Sharif University of Technology, Tehran, Iran, in 1999 and 2001, respectively. She then joined the Georgia Institute of Technology, Atlanta, GA, in 2002, where she received her Ph.D. degree in the School of Electrical and Computer Engineering in 2007. Her research interests lie in the area of telecommunications with a focus on error-control coding, wireless ad-hoc and sensor networks, and cognitive radio. Nazanin received the outstanding research award from the Center for Signal and Image Processing at the Georgia Institute of Technology in Spring 2007.

**DR. NAZANIN RAHNAVAR**

**Dr. Reza Abdolvand** received his B.S. and M.S. degrees in electrical engineering from Sharif University of Technology, Tehran, Iran, in 1999 and 2001 respectively. In 2002, he joined the Integrated MEMS group at Georgia Institute of Technology, where he received his Ph.D. in the School of Electrical and Computer Engineering (2007). His research interests are in the areas of design and fabrication of resonant MEMS devices for sensors and RF applications, integrated micro-systems and piezoelectric micromachining technologies. He is the author of more than 20 technical articles and three patents.

**DR. REZA ABDOLVAND**
Dr. R. (Rama) Ramakumar, PSO/Albrecht Naeter Professor and Director of the Engineering Energy Laboratory was named Regents Professor at the June 2008 meeting of the OSU Board of Regents.

He started his teaching career at age 20 in 1957 as an Assistant Lecturer of Electrical Engineering at the Coimbatore Institute of Technology (CIT), Coimbatore, India after receiving his B.E. with first rank from the University of Madras, India followed by an M. Tech. degree from the Indian Institute of Technology – Kharagpur. He came to the US in 1959 as a TCM (now USAID) scholar and completed his Ph.D. from Cornell University, Ithaca, New York in 1962. After five more years of service at CIT, he came to Oklahoma State University in 1967 as a Visiting Associate Professor of Electrical Engineering.

During his 41 year career at OSU, he has held many positions – Professor, 1976– , Director, Engineering Energy Laboratory, 1987– , PSO/Albrecht Naeter Professor, 1991–, and Graduate Coordinator, 1994–present., He served as the Interim Department Head twice — 1994–95 and 1996–97.

Over his career, Dr. Ramakumar has been primarily involved in renewable energy and energy systems research. He has authored a text book entitled “Engineering Reliability: Fundamentals and Applications” published by Prentice Hall and nearly 200 publications in various Journals, Transactions and National and International Conference Proceedings. He was named a Fellow of IEEE in 1994 for “contributions to renewable energy systems and leadership in power engineering education.” Dr. Ramakumar received the University-wide Burlington Northern Faculty Achievement Award in 1993 and the College-wide Halliburton Outstanding Faculty Award in 1992.

Dr. Ramakumar is named Regents Professor

Dr. Ramakumar received
2008 Distinguished Service Award from IEEE

During the recent IEEE Power and Energy Society (PES) annual general meeting held in Pittsburgh, PA, Dr. Rama Ramakumar received the 2008 Distinguished Service Award from the Energy Development and Power Generation Committee of the IEEE/PES. The citation reads “for his many years of dedicated service and fine leadership as Chairman of the Energy Development Subcommittee.”

This is the second time Dr. Ramakumar has received the Distinguished Service Award from the Energy Development and Power Generation Committee. The last time was in 1999 for the service to the Committee as the Awards Chair.
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