

COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL ENGINEERING



ELECTRONIC NEWSLETTER / DECEMBER 2009 / WWW.EE.PSU.EDU

Our department magazine, *Inside EE*, was mailed in early November. If you didn't receive a copy, please send your address to cls118@psu.edu. If you live in or around State College, stop by the department office for your copy.



ELECTRICAL ENGINEERING STUDENTS EMBRACE ENTREPRENEURIAL SPIRIT

Electrical Engineering graduate students **Erik Davidson**, **Erik Weir**, and **Daniel Weiss** have mastered the art of time management. They have to. As full-time students and owners of their own company, time is at a premium. The three students, along with former acoustics master's student **Nicholas Platt**, formed Buzby Networks in June 2008.

The idea behind Buzby Networks was developed during fall 2007 as a class project in the Sensor and Controller System Integration course taught by **Khanjan Mehta**, senior research associate in Electronic and Computer Services and affiliate faculty, School of Engineering Design, Technology, and Professional Programs. In the course, the students developed an indoor locator system initially designed for the geriatric population. **Sven Bilén**, associate professor of electrical engineering, is a key Buzby Networks adviser and provides technical direction in the development of the commercial product. "It's exciting to see ideas develop beyond the classroom and begin to move out into the marketplace," said Bilén.

During the market research, the students quickly recognized the need and the real market potential of their locating system. With Bilén, the team formed Buzby Networks, a Pennsylvania limited liability company, and continued product development with grant money from the National Collegiate Inventors and Innovators Alliance and The Technology Collaborative.

Buzby Networks now has a patent pending for its Real-Time Locating System (RTL), which can be considered an "indoor GPS." The product consists of a ZigBee-based wireless router infrastructure, mobile wireless tags for tracking, and graphical user interface PC software that shows positioning. It has two-meter accuracy and will never provide an incorrect location.

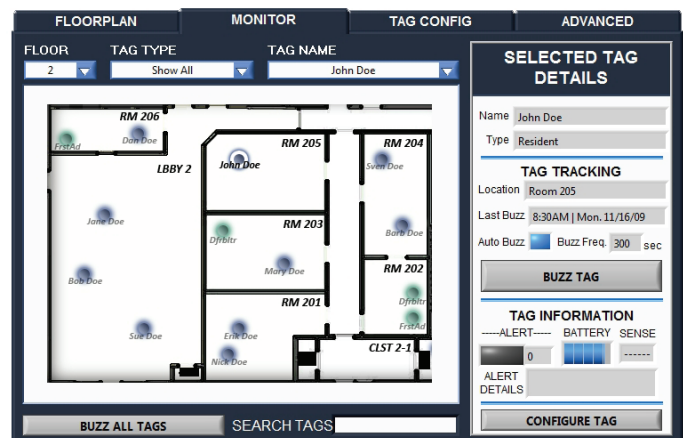
The company is located in The Blue Line business incubator in downtown State College where the students spend a lot of their time. "My coursework and research is put into perspective by my work on Buzby Networks," stated Weir. "The company allows me to see the real-world applications of my research and coursework."

In October, the students participated in the 2009 Idea to Product (I2P) Global Competition in Austin, TX. Buzby Networks won 3rd place in the Technology Entrepreneurship Society Global Champion-



ship round at the competition. The company plans to use the prize money to help purchase critical software needed for development.

Buzby Networks is now raising funds through possible grants to get the business to the level needed to sustain their activities. A commercially viable product is expected by mid-2010 at the same time that Davidson, Weir, and Weiss will all graduate with master's degrees. "I am proud of this team's accomplishments and dedication," said Davidson. "It will not be long before our hard work begins to pay off with our first commercial deployment."

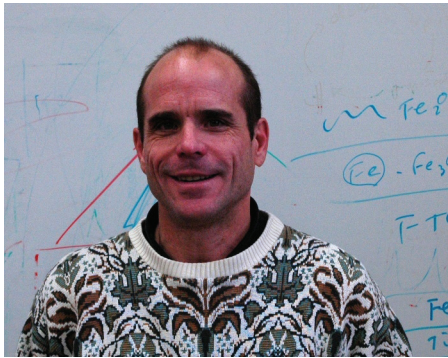


Screenshot of the developing software interface

FACULTY SPOTLIGHT

Craig A. Grimes received dual bachelor degrees in electrical engineering and physics from Penn State in 1984. He completed his master's and doctoral degrees in electrical and computer engineering at the University of Texas, Austin in 1986 and 1990, respectively. Upon graduation, Grimes joined the Lockheed Palo Alto Research Laboratories where he worked on artificial dielectric structures.

In 1994, Grimes joined the Department of Electrical and Computer Engineering at the University of Kentucky, where he invented and developed several remote query sensor platforms (and met his wife).



Grimes was named the Frank J. Derbyshire Professor in 2000.

Grimes joined the Department of Electrical Engineering at Penn State in 2001 as an associate professor. He was promoted to professor in 2005. His research interests include the photocatalytic reduction of CO₂, solar production of hydrogen by water photoelectrolysis, organic-inorganic hybrid solid-state solar cells, propagation and control of electromagnetic energy, and remote query environmental sensors. Currently, Grimes' research team has recently received more than \$4 million in funding from private sources, the Department of Energy's Advanced Research Projects Agency-Energy (ARPA-E), and the National Science Foundation to support research (and development) on using sunlight to photocatalytically convert CO₂ and water vapor into hydrocarbon fuels. "Through our research, which is vertically integrated across multiple disciplines and fields, we seek to create useful technologies for which there is a definite need in the real world. Right now, there is a clear need to do something about the amount of CO₂ in the atmosphere and the 'business as usual' approach to fossil fuels. It is exciting to work on such projects," commented Grimes.

Grimes is founder or co-founder of four different companies that have successfully commercialized three of his inventions. He has co-authored four books, contributed over 300 archival journal publications (some of which are worth reading), written a dozen book chapters, and obtained over two dozen patents. In 2007, Grimes received the Penn State Engineering Society Outstanding Research Award.



Home repairs, soccer coaching and mountain biking fill any free time Grimes has. Grimes, his wife—Elizabeth C. Dickey of Materials Science and Engineering, and two children live in Boalsburg.

STUDENT SPOTLIGHT

Zikri Bayraktar, graduate student in electrical engineering, has made Penn State his home since 2001. Originally from Turkey, Bayraktar ranked 3rd out of 1.4 million in the National University Entrance Exam and was awarded a full scholarship to study abroad at Penn State. Bayraktar entered the Integrated Undergraduate and Graduate Program offered by the Schreyer Honors College and received his B.S. and M.S. degrees in electrical engineering in 2004 and 2006. He began working on his Ph.D. degree in 2007 and is expecting to graduate in December 2010 with a focus on antenna engineering, computational electromagnetics and metamaterials.



Bayraktar has been a graduate research assistant for the Computational Electromagnetics and Antennas Research Lab since 2005 and their webmaster since 2003. He is a student member of IEEE and has been an editorial assistant for the IEEE Antennas and Propagation Magazine. Included in his many honors are: Winner of the 2009 Central Pennsylvania IEEE Chapter Student Paper Competition, 2008 IEEE Antennas and Propagation Society Ph.D. Research Award, and the 2004 Arthur Glenn Undergraduate Summer Research Award given by the Schreyer Honors College.

While at Penn State, Bayraktar has authored a number of papers including 17 presented at conferences and at least four journal publications. Bayraktar commented on his time at Penn State, "It was very tough yet very rewarding educational experience." While firm plans are not yet established upon his graduation, Bayraktar is confident and enthusiastic about his future. This bright young man will have any number of opportunities available to him.

NEWSLETTER SPONSORSHIP OPPORTUNITY

Our monthly electronic newsletter has a distribution of 5,000 alumni, friends, colleagues, and universities. In addition, we print a number of newsletters each month to send to electrical engineering departments in universities across the country. This has been a wonderful means to keep in touch with our alumni, and spread the word about the activities and events of the electrical engineering department.

We are currently seeking sponsors for our newsletters.

In return for sponsoring a monthly e-newsletter, your name or company name will be announced in the newsletter thanking you for your support. In addition, your name or company name will be listed on our website, with a link if desired, to your company website.

For more information, please contact Cathy at 814-863-0253 or cls118@psu.edu.

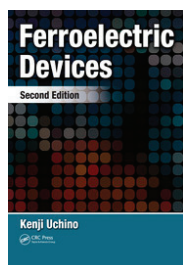
FACULTY NEWS

Craig A. Grimes, professor of electrical engineering, gave an invited talk titled “Visible to Near IR Photon Harvesting in Polymer Based Hybrid Solar Cells Using Dye-sensitized TiO₂ Nanotube Arrays” at the Materials Research Society Fall meeting in Boston, MA in December. Grimes (with co-PI O. K. Varghese) received a research award, “Scale Conversion of CO₂ and Water Vapor to Hydrocarbon Fuels” from the Department of Energy, Advanced Research Projects Agency-Energy. The award of \$1,908,732 is for the time period December 2009 – November 2012.

Ken Jenkins, professor of electrical engineering and department head, recently attended the 43rd annual Asilomar Conference on Signals,

Systems, and Computers held in Pacific Grove, CA, to present a paper titled “Fault Tolerant Fermat Number Transform Domain Adaptive Filters Based on Modulus Replication RNS Architectures” that was coauthored by C. Radhakrishnan, S. Raza, R. N. Nickel, and W. K. Jenkins.

Kenji Uchino, professor of electrical engineering, authored a book titled “Ferroelectric Devices.” In the second edition, this book reviews the state-of-the-art research and development trends in nano and optical technologies that are bringing ferroelectric devices to the forefront.



Congratulations to **Mark Wharton** on his promotion to associate professor. With 30 years of experience in industry as a practicing design engineer specializing in circuit design for communications systems, Wharton joined the faculty in 2000.

STUDENT RECOGNITION

Siddharth Advani, graduate student in electrical engineering, attended and prepared a poster for the 2009 Quantitative Nondestructive Evaluation conference at the University of Rhode Island in July. His paper “Guided Wave Thickness Measurement Tool Development for Estimation of Thinning in Plate-Like Structures” will be published in the “Review of Progress in Quantitative

Nondestructive Evaluation,” volume 29 in Spring 2010.

Electrical Engineering graduate students **Erik Davidson**, **Erik Weir** and **Daniel Weiss** along with former acoustics master's student **Nicholas Platt** won third place in the Technology Entrepreneurship Society Global Championship round at the 2009 Idea to Product Global Competition.

Heath Hofmann, associate professor of electrical engineering, is leaving the department at the end of December to join the faculty at the University of Michigan. Hofmann received his master's and doctoral degrees from the University of California at Berkeley in 1997 and 1998. He joined Penn State in 1999 and is a member of the Power Systems research group. We wish him the best of luck as he starts this new chapter of his career.



Calendar

December 4	Eta Kappa Nu Centennial Celebration
December 18	End of fall semester
December 19	Graduation
January 11	Spring semester begins

LATE-NEWS PAPER RECEIVES INTERNATIONAL ATTENTION

Researchers from Penn State release late-news paper for inclusion at the 55th annual IEEE International Electron Devices Meeting (IEDM) in December in Baltimore, MD. The interdisciplinary research team, comprised of **Suman Datta**, associate professor of electrical engineering; **Theresa Mayer**, professor of electrical engineering; and **Vijaykrishnan Narayanan**, professor of computer science and engineering; collaborated with **Darrell Schlom**, professor of materials science and engineering at Cornell University, and **Amy Liu**, research and development director at IQE Inc., a company specializing in compound semiconductor growth. The paper, titled “Experimental Demonstration of 100nm Channel Length In_{0.53}Ga_{0.47}As-based Vertical Inter-band Tunnel Field Effect Transistors for Ultra Low-Power Logic and SRAM Applications” and presented by electrical engineering graduate student, **Saurabh Mookerje**, describes an interband tunneling field effect transistor built on InGaAs – a compound semiconductor alloy.

The team has received international press coverage with news articles in “Nanotechnology Now,” “EE Times,” and “Euroasia Semiconductor” among others. Datta stated, “We are very excited about this experimental breakthrough in tunnel transistor research which could potentially be the work horse for ultra low power electronics in the near future.”

The IEDM is the premier device conference for the presentation of applied research in microelectronic, nanoelectronic and bioelectronic devices with acceptance rate below 30 percent. More than 215 papers will be presented by researchers from corporations, universities and governments lab worldwide.

DEPARTMENT ALUMNI ASSOCIATION

Alumni Assist with Design Review

Volunteers from the electrical engineering department alumni association assisted with the sponsored projects section of EE 403W Senior Capstone Design in November. The five student teams each created a critical design review document for their project, which must be reviewed and graded as part of the overall project. The alumni volunteers provided feedback on measures such as technical writing skills; design viability and constraints; and customer need fulfillment. The alumni reviewer's evaluation and comments will be valuable guidance for the students as they rush to build their projects for the Technology Showcase in the second week of December. **Tim Wheeler**, instructor for the class, commented, "We are indeed lucky that so many concerned alumni and professionals have stepped forward to help the students make the daunting transition from student to professional practicing engineer." To volunteer to help with this effort in future semesters, please contact Eric Kline ekline@alltrafficsolutions.com.

Mentoring Program Recruiting Volunteers

The electrical engineering alumni association is in the planning stages of creating a mentoring program for the department. Details should be finalized after the first of the year. In the meantime, we are collecting names of alumni who are interested in participating. You do not have to live in close proximity to the University. Please forward your name and contact information to Cathy at cls118@psu.edu.

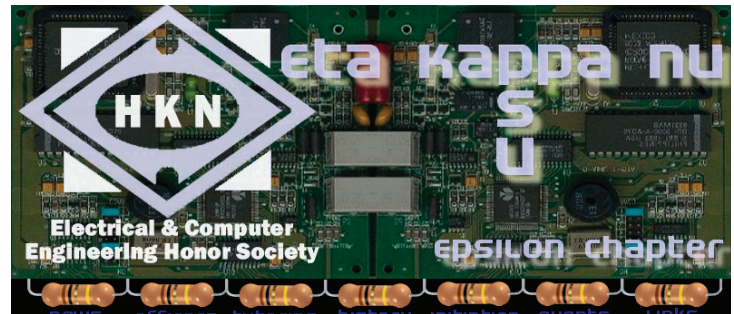
SHOWCASE YOUR BUSINESS AND RECRUIT GREAT ENGINEERS

The Engineering Career Resources and Employer Relations office and the Society of Women Engineers are hosting an

Engineering Career Week

in February 2010. Events include a diversity showcase, networking events, career fair, and individual interview opportunities. This event is open to all engineering students.

If your company would like to participate in this great program or if you would like more information, please access the following: www.engr.psu.edu/career/ecw/



EPSILON CHAPTER OF ETA KAPPA NU CELEBRATES ITS CENTENNIAL

Epsilon Chapter of Eta Kappa Nu (HKN) Association, the electrical and computer engineering honor society, was chartered at Penn State on Dec. 4, 1909. The honor society, founded in 1904 at the University of Illinois, seeks to recognize students for their academic achievement, character, leadership, and teamwork. Epsilon Chapter was the fifth established chapter; currently there are nearly 200 HKN chapters worldwide. To be eligible for membership, students must demonstrate academic accomplishment and be at least a junior-level electrical or computer engineering major.

The Epsilon chapter at Penn State has maintained a variety of annual activities, such as undergraduate tutoring, information nights for graduate school and undergraduate elective courses, as well as a host of networking opportunities. The chapter adviser, **Jack Mitchell**, professor of electrical engineering, comments, "The students have always worked hard to assist others in the department, particularly with regard to activities pertaining to academic affairs. It's exciting to be a part of this organization as it recognizes its one-hundredth year at Penn State."

A centennial celebration is planned on **Dec. 4**, beginning at 4:00 PM in 101 EE East. Present members and alumni of HKN are cordially invited to this event; we hope to see you there.

Alumni - Pictures to share, news to post, we'd love to hear from you!

Contact Information:

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Web: www.ee.psu.edu

Please submit news items to: Cathy McClellan at cls118@psu.edu

This publication is available in alternative media on request.

Penn State is committed to the affirmative action, equal opportunity, and the diversity of its workforce.

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