

# ECE News

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

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This newsletter is published twice a year for alumni, faculty, staff, and friends by the Department of Electrical and Computer Engineering of Rutgers, The State University of New Jersey, Piscataway, NJ 08854

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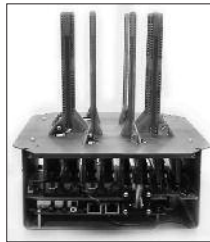
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Or contact the editor,  
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**RUTGERS**  
School of Engineering

## High-Speed Internet for Transit Vehicles

**K**ishore Ramachandran, working under the supervision of Prof. Marco Gruteser, and in collaboration with Ravi Kokku and Karthikeyan Sundaresan at NEC Labs America (Princeton, NJ), has developed a system for adapting the beam patterns of a smart array antenna mounted on a moving vehicle based on Global Positioning System (GPS) location information. This significantly improves communication throughput from the vehicle to infrastructure networks and could be used on a commuter bus, for example, to provide high-speed Internet connections to passengers' laptops, smartphones, and other mobile devices.



The system, called R2D2, relies on directional antennas and base station macro diversity, which are two well-known, independently developed mechanisms for improving the uplink connectivity of mobile clients. In this work, key discoveries include: (a) systems that combine both mechanisms can achieve higher throughputs, and (b) combining both mechanisms involves addressing a fundamental tradeoff between directionality and diversity. R2D2 addresses both concerns using wider multi-lobe

beams, which is in contrast to the mere steering of narrow beams used in conventional smart antenna systems. Specifically, R2D2 searches through a limited set of beam patterns with different numbers of lobes. Its two-stage algorithm uses both runtime adaptation and candidate patterns that are cached based on the geographic location of the client. Experiments with this improved smart antenna system mounted on a vehicle show throughput increases of up to 45% over conventional techniques.

Kishore defended his dissertation in November 2008 and has since joined NEC Labs America in Princeton, N.J.



## ECE Scholarships

**T**he Electrical and Computer Engineering Department Scholarship and Fellowship Committee has awarded over \$40,000 in new scholarships for the academic year 2009–2010. The scholarships will reward deserving full-time ECE students and improve their academic experience at Rutgers. These awards were made possible by generous donations from alumni, faculty and friends. Further tax-deductible donations to our ECE scholarships and fellowships are possible through the Rutgers Foundation dedicated ECE online link <http://support.rutgers.edu/MakeAGift/OnlineGiving/fundlinks.aspx?siteid=111/>

**PLEASE  
JOIN US!**

**SECOND ELECTRICAL AND  
COMPUTER ENGINEERING  
ALUMNI RECEPTION**

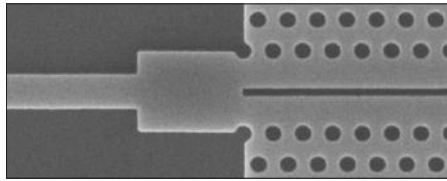
**Wednesday, June 10, 2009 • 6 – 8 p.m.  
CORE Building Board Room, 7th Floor,  
Busch Campus, Piscataway, N.J.**

RSVP June 1, 2009 with your name and graduating class(es) by email to [alumni\\_reception@ece.rutgers.edu](mailto:alumni_reception@ece.rutgers.edu) or by calling Ms. Lynn Ruggiero at 732/445-5241.

Light refreshments will be served.

## Professor Wei Jiang Receives AFOSR Grant

Assistant Professor Wei Jiang recently received a grant from Air Force Office of Scientific Research (AFOSR) to develop light-weight nano-optical components for next-generation radars. The grant is part of Center for Silicon Nanomembranes established through the Multidisciplinary University Research Initiative (MURI) of U.S. Department of Defense. The Center includes seven professors from the University of Texas at Austin, University of Illinois, Stanford University, and Rutgers University. Professor Jiang's research in this program aims at developing tiny, airy optical waveguides on nanoscale silicon membranes, which can provide disproportionately long time delays for use in phased array antennas of crucial importance for national defense. One promising approach is to slow down light by nano-photonics structures called photonic crystals. Professor Jiang's prior research in silicon photonics and photonic crystals led to the development of the first 1GHz silicon photonic crystal modulator,



**A photonic crystal nanostructure made on silicon that can slow down light significantly, patented by Prof. Jiang.**

which was reported by *EE Times*, *Nature Photonics*, *Laser Focus World*, and many other media sources. Apart from the radar applications, Professor Jiang is exploring the potential of silicon photonics in novel applications such as optical interconnects for next-generation computer chips. As many suspect silicon microelectronic chips approach their ultimate physical limits, photonics opens the door to a new world for silicon chips—thanks to the recent advances made by researchers worldwide including Professor Jiang.

## NSF Center for Autonomic Computing Meeting

Rutgers University successfully hosted the Semi-Annual Meeting of the NSF Center for Autonomic Computing (CAC) (A National Science Foundation Industry/University Cooperative Research Center) on April 15–16, 2009 on the Busch Campus, Piscataway, N.J.

The goal of CAC is to combine resources from universities, private companies, and the federal government to conduct fundamental

research on making computer systems and applications more efficient, effective and manageable. The research accomplishments of Rutgers CAC and its partners at the University of Florida and the University of Arizona were showcased at this event. The meeting agenda included research presentations as well as posters and demonstrations.

Visit <http://nsfcac.rutgers.edu/Spring09/> for a description of the event.



**NSF Center for Autonomic Computing Spring Meeting at Rutgers, April 15–16, 2009**



**PROFESSOR ROSE** wins the Engineering Governing Council's Excellence in Teaching Award for the second time in three years.

## Bhat Receives 2009 Yahoo! Grid Award

The Grid Award is a yearly award that is presented within Yahoo! for evangelizing Grid (Hadoop, Pig, Zookeeper) technologies, profiling and optimizing Map Reduce, Pig applications within Yahoo!, migrating various mission critical applications which have very strict SLA requirements to the Grid and development of various Grid tools to help users migrate to the Grid. Viraj completed his Ph.D. under the guidance of Professor M. Parashar in Spring 2008 and joined Yahoo! in May 2008.

## Dermatology Research with J&J

Professor Kristin Dana and graduate student Siddharth Madan are collaborating with researchers at J&J in Skillman, N.J. This multi-disciplinary research has focused on combining computer vision with dermatology to accomplish quantitative assessment of skin appearance over time and under multiple imaging modalities. Their main collaborator at J&J is Dr. Oana G. Cula, an alumnus of Rutgers University, who did her Ph.D. dissertation with Professor Dana. A recent result of this work is a technique to automatically register high resolution images so that fine-scale skin details such as pores and moles are accurately aligned. J&J has awarded funding to support this collaboration.

## Liu Wins Best Paper Award

Song Liu, a Ph.D. student from WINLAB, advised by Dr. Wade Trappe and Dr. Larry Greenstein, has won the Best Paper Award at the Sixth International Conference on Wireless On-demand Network Systems and Services (IEEE WONS 2009). The conference took place in Snowbird, UT on February 2-4, 2009. The paper is co-authored by Dr. Yingying Chen of Stevens Institute of Technology, Hoboken, NJ. Song Liu's research activities currently focus on interference analysis in dynamic spectrum access networks and broadband over power line systems. His paper, titled "Non-interactive Localization of Cognitive Radios Based on Dynamic Signal Strength Mapping," addresses the issue of localizing unknown transmitters in

*continued on page 4*

## Steven Philip Petrucelli Scholarship

By Steven Philip Petrucelli  
(M.S., 1976; Ph.D., 1978 Rutgers)

The early 1970s was a turbulent time for many American families: the unraveling of the Vietnam War, massive corporate layoffs, runaway inflation, double digit mortgage rates, gas lines, and something very foreign to most college students reading this article—campus activism. My father lost his job during my sophomore year of college and I scrambled to find ways to take summer classes and graduate a semester early to save money. At the end of the fall semester of 1973, I completed the requirements for the BSEE degree at Lehigh University and headed home. It was a cold, rainy December day, and the ride back to New Jersey was uneventful until the traffic on Route 287 slowed, and ultimately stopped near Bound Brook. There was a sign for Rutgers, and I had heard some nice things about the University so I decided that a detour to Old Queens was a better use of my time than burning out the clutch on my old Volvo crawling along in traffic. Very few people were on campus as exams were over for Rutgers as well. I navigated my way over to Murray Hall (the former home of EE) and it was a major let down as the place looked dark and cluttered, and was filled with old machines and antique relics of Electrical Engineering. At that point I had seen enough and was ready to head home and fight the traffic. As I was leaving the building I heard a sharp, piercing voice echo down the hall "If you're looking for the EE department, it moved across the river to the Busch Campus." As I walked towards the man, he introduced himself as Fred Grunther, Instrument Maker for the EE Department and said, "I'm heading home now, so if you're interested in seeing the new campus you can follow me."

I arrived at the new Engineering Building on Busch Campus and started to walk around. In stark contrast to Murray Hall, the building was immaculate and equipped with very impressive laboratories. By now it was late in the day and very few people were in the building. I was thinking that maybe I should come back another time and looked for a way back to my

car. In search of my car, I headed towards the parking lot and as I walked through the double doors into the "D" wing, I arrived at the offices of the EE Department. Glancing down the hall, there was a light shining from the office of the graduate director, so I ventured that way. As I stood in the door opening, Professor Sylvan Fich looked up and grumbled, "Are you looking for something?" "Well... I am thinking about going to Graduate School..." He invited me in and started asking a series of questions about my background. I came prepared with a transcript that he reviewed, and then remarked "Lehigh Magna Cum Laude, not bad." Then he pulled out a problem from the Masters Comprehensive Examination and asked me how I would solve it. It was a plot of the response of a filter in the frequency domain, and I started to sketch the first derivative and then the second derivative of the function down to a series of delta functions, etc...and before I could finish my work, he said fine, you can come here. I never did take



**Steve Petrucelli with Chirag Walawalkar, one of three recipients of the Petrucelli Scholarship this year. Chirag, a fourth year student will graduate with a BSME this Spring. Chirag chose Rutgers over Stevens, NJIT, and TCNJ.**

the GRE, nor did I ever fill out an application, but three days later I had an offer of acceptance from Rutgers in my mail box. Little did I know that a traffic jam on Route 287 was about to change the direction of my life for the next 30 years.

I used the next nine months to work full time, starting as an Electronic Technician at \$660 per month, and then as a Systems Engineer at \$1000 per month, in order to save enough money so I could attend graduate school. By the end of the summer of 1974, I had saved enough money that would allow me to enroll in the Master's program as a full-time student. However, my employer wanted me to stay with the company therefore I worked out a part-time work schedule coupled with a 12 credit class schedule. At a cost of \$15 per credit, my small nest egg, along with steady part-time employment, put me in a good position to work on my graduate education. Life as a graduate student at Rutgers was very rewarding as I had a chance to work with professors that not only had very strong academic credentials, but also had diverse Industrial experience. Many faculty members either had their own businesses or held positions at Corporations such as RCA,

PSEG, Western Electric, Bell Labs, Naval Ordnance Laboratory, Fort Monmouth, Merck, Union Carbide, Johnson & Johnson, and Squibb in parallel with their teaching responsibilities. At that time, certain Graduate Courses were offered off site at RCA Somerville, as well as at Fort Monmouth. I went out of my way to register for these sections in order to study and network with working professionals. In addition to Professor Fich, I feel very fortunate to have studied with Louis Rosenthal, Sid Deutsch, Roy Potter, and Walter Welkowitz. Finally, one of the best things about being a graduate student was having a desk in one of the cubicles in D-144 where approximately 20 of us worked and studied together, seven days a week, at all hours of the day and night!

After earning my Ph.D. in 1978, I left the University and embarked on a full-time career in Industry working in the field of Scientific and Medical Instrumentation. In 1980, while I was the Director of Research & Development at Mettler Instrument Corporation, I received a call asking if I could help out teaching a course as the EE Department was short handed due to sabbaticals and unexpected leaves of absence. That was the beginning of my 23 years of service as a part-time professor at Rutgers University. As a one-time "favor" took on new meaning and expanded responsibilities, and in the spirit of my mentors, I worked full time in Industry throughout the entire period. Using funds from one of my start up ventures, I made regular contributions to the University's Special Gifts and Grants Account in support of student projects and research. When I left the University in 2003 there was over \$70,000 which was used to create the Petrucelli Endowed Scholarship. Since that time, the fund has grown to over \$100,000 and numerous awards have been given over the past five years. Moving forward, it is my hope to expand this fund in order to provide more resources to support students for generations to come.

The scholarship endowment is managed by the Rutgers University Foundation and recipients are selected by the Scholarship and Fellowship Committee of the Department of Electrical and Computer Engineering. This scholarship is not "need based" and was designed to reward Undergraduate ECE students who are New Jersey Residents, and who have demonstrated a professional work ethic, self improvement, and achievement. I know first hand how difficult it is to pay for Graduate School working part time as an Electronic Engineer, and it is a great personal pleasure that I am able to help students by providing this financial assistance. I honestly would not have achieved the professional and financial success that I have enjoyed in my life had I not attended Rutgers University and I am forever indebted to this great institution.

## ALUMNI CORNER

## From Engineering to Law: Benjamin M. Williams

**B**enjamin M. Williams (B.S., Electrical and Computer Engineering, 2001; J.D., 2008) has pursued a non-traditional career path for engineers—as an appraiser and lawyer. Since graduating with Highest Honors as an undergraduate, he has worked in the appraisal and valuation consulting field. His performs complex machinery and equipment appraisals, such as appraising power plants. In 2008, Dr. Williams obtained his Juris Doctor law degree from Rutgers School of Law—Newark after attending for four years as a part-time evening student while concurrently working full-time. He passed the New Jersey and New York bar examinations, and is admitted by New Jersey as an Attorney at Law.



Benjamin M. Williams

Dr. Williams has worked at MR Valuation Consulting, LLC (MRVC) for over seven years since graduating Rutgers in 2001. His expertise is in appraising energy and utility property such as nuclear power plants, electric transmission lines, natural gas distribution pipelines, and water utilities, worldwide. He also has extensive experience appraising multi-million dollar real estate (e.g. the Sears Tower and GM Building). He helped his company expand from one office in New Jersey, to additional offices in New York City, Los Angeles, Miami, Chile, China, and Hong Kong. He opened and now manages the New York City office.

Dr. Williams was very active as a Rutgers undergraduate student. He was the president of the New Jersey Beta (Rutgers) chapter of Tau Beta Pi, the Engineering Honor Society, organizing events for over 100 members and 2,000 engineering students. He was also active with Eta Kappa Nu, the National Electrical and Computer Engineering Honor Society. He successfully completed the School of Engineering Honors Program, and was on the Dean's List all semesters. As an undergraduate, he also worked as a researcher in Professor Kristin Dana's computer vision lab in the Electrical and Computer Engineering Department. Dr. Williams was a "Peer Mentor" with Rutgers Department of Mathematics for two years, acting as a teaching assistant and recitation instructor for Pre-Calculus students.

Dr. Williams lives in Bronx, New York with his wife, newborn daughter, and adopted ex-racing greyhound.

ECE  
Open House

**Dr. Ivan Marsic presents a talk to prospective students and their families during the ECE Open House on April 25, 2009.**



## BEST PAPER AWARD

*continued from page 2*

a dynamic spectrum access network. It presented two range-free localization algorithms based on a dynamic mapping of received signal strength (RSS), and is unique in that it does not require cooperation from the cognitive radio to be located. Both simulation results and testbed evaluations have demonstrated that, the proposed schemes can achieve higher accuracy of location estimation than existing non-interactive and RSS based methods for most realistic channel conditions.

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