

Portable Lunar Habitat from NASA Assembled at University of Maine



The Electrical and Computer Engineering Department in collaboration with the Mechanical Engineering Department and the University of Southern Maine unveiled impressive new technology being developed with NASA at a ribbon cutting ceremony on January 21 for the new Wireless Sensing Laboratory at UMaine. A representative from NASA was also on hand to showcase the model lunar habitat. The inflatable, 42 foot-by-10-foot

structure, which when developed is expected to one day house up to 15 astronauts on the surface of the moon or Mars, is undergoing multiple phases of research and development at UMaine.

Other lunar habitats have been constructed for testing since the early 1990s, many by private U.S. companies, but none has ever been deployed. According to Mauricio Pereira da Cunha, Associate Professor of Electrical and Computer Engineering, the research UMaine is conducting will enable the lunar module to be used at the International Space Station within the next 10 years. “The concept of a lunar habitat has been around for some time, but we are improving it, making it a reality,” he said. “Technologies that will monitor the structure deployment and its exterior once deployed will help it function properly and are being worked on,”

The habitat itself is not the primary concern of UM researchers. Instead, they are focusing on what is called “wireless sensor technology.” When the habitat is deployed, sensors will be attached to its exterior and hooked up to computers inside, monitoring everything from air pressure and temperature to debris collisions and humidity. This way, if there is a leak in the structure or damage to its outer walls, astronauts can pinpoint the problem and fix it quickly, all on the planet’s surface.

“Humans are first at NASA, and we’ve envisioned this technology for a while now. The work being done will help to protect the astronauts and make their lives a lot easier,” said George Studor, an assistant to the Chief technologist at NASA’s Johnson Space Center in Houston.

Mr. Studor has long worked to make the lunar habitat technology a reality. UMaine became involved after he was approached in 2007 by Dr. Ali Abedi, Assistant Professor of Electrical and Computer Engineering. Dr. Abedi had an idea to make the habitat safer and more functional. Studor said that rather than develop the technology in Houston at the Johnson Space Center, he decided it was a better idea to allow a university to make the improvements ([more](#)). The ribbon cutting ceremony was covered by the Bangor Daily News and most of the local TV stations.

The Wireless Sensing Laboratory will be an integral part of the ECE department wireless engineering education and research at Maine. We welcome private support or corporate sponsorships for this project. If you are interested, please contact Dr. Mohamad Musavi (musavi@eece.maine.edu) or Patricia Cummings, Director of Development, College of Engineering at Pat.cummings@umit.maine.edu for further information.

Wireless High Temperature Sensor Brings New Technology into Jet Engines



Jet engine equipped with state-of-the-art temperature sensor.

Electrical and Computer Engineering Professor Mauricio Pereira da Cunha and a team of faculty, staff and student researchers at the University of Maine's Laboratory for Surface Science and Technology (LASST) have developed a thumb-size wireless, heat-resistant sensor which allows maintenance workers to monitor temperature, pressure, corrosion and vibration inside an engine. It's the first of its kind in the world and its creators say it could revolutionize the jet engine

maintenance industry. Now when an engine has problems, an engineer must disable the unit completely, which Prof. da Cunha points out, is costly and often unnecessary. The new sensors would eliminate that need and reduce maintenance cost while improving engine efficiency, creating additional savings on fuel costs.

After testing the sensors in university labs for months, UMaine researchers partnered with the Maine Air National Guard base in Bangor to perform tests in a more realistic setting. Maine Air Guard's 101st Maintenance Group lent researchers a dormant jet turbine engine from a 1957 military jet to perform the tests. The sensors are able to withstand temperatures of up to 1,800 degrees Fahrenheit, more than twice as hot as any previous wireless sensor, and so far, the sensors have held up ([full story](#)).

Robert Lad, Professor of Physics and Director of LASST and co-investigator in this project, said the one-of-a-kind technology pushes the limits of engine performance and maintenance. "We've never been able to put sensors directly inside the engines," he said. The research is being closely watched by companies such as Pratt & Whitney, Rolls Royce, Honeywell, General Electric, NASA and several branches of the U.S. military.

This story was also covered extensively by the Bangor Daily News and local TV stations.

Dean's Excellence Award



Electrical and Computer Engineering faculty member Dr. Rick Eason (second from left) received the 2010-11 Dean's Excellence Award. Rick has recently developed a 4-credit hour course with a laboratory component (ECE 177-Introduction to Programming for Engineers) to familiarize the first year ECE students with programming concepts from both software and hardware point of views. In addition to this course, he also teaches several other Electrical and Computer Engineering courses covering a large percentage of the department course load. Rick also participates in high school visits and tours of the ECE Department as well as participating in two

successful MTI/MTAF grants with the School of Marine Sciences and Mechanical Engineering. In January, Rick travelled to Louisiana State University for a training session on the NASA funded Scientific Ballooning program, which is managed by the Maine Space Grant Consortium. Rick is currently working with several students to implement and launch a scientific balloon into space from the University of Maine campus in April. The balloon will carry a variety of sensors on board for real-time data collection. Please stay tuned for the full story.

High School Visits

On January 26, 2011, Professor Rosemary Smith visited with students at the James F. Doughty Middle School in Bangor, Maine. They discussed nanoscale science and engineering, learned how an atomic force microscope works and watched a real atomic force microscope create an image of the surface of a DVD.



Prof. Rosemary Smith with middle school students.

Maine VEX Robotics Championship

Assistant Prof. Nuri Emanetoglu and Lecturer Andy Sheaff were judges at the [Maine VEX Robotics Championship](#) held at the Bangor Auditorium on Saturday, Feb. 5, 2011. The ECE Department was a sponsor of the championship which saw 17 high school and middle school robotics teams compete for a chance to participate in the World Championships, to be held in Orlando, Florida in April. ECE student volunteers included David Hart, Anthony Nuzzo, and

Sara Nadeau. The VEX Competition is a nationwide event with over 3,600 teams participating across the nation.



Maine VEX Robotics Championship

ECE Loses Dedicated Lecturer

It is with great sorrow to inform you that ECE lecturer Eric Beenfeldt passed away on December 15, 2010. Eric received his B.S. in Electrical Engineering from Lafayette College in Easton, Pennsylvania in 1966 and worked as a design engineer on NASA projects for the Lunar Module that landed on the moon on 1969. In 1979 he was hired by the University of Maine as a Teaching/Research Associate Laboratory Coordinator. He completed his M.S. in Electrical Engineering in 1987 and was promoted to a lecturer position where he served the department from 1987 until his retirement in May 2010. Eric was an exceptional teacher and contributed significantly to the work of many faculty members by acquiring, developing, constructing, and maintaining much of the hardware and other equipment upon which our research so heavily depends. For his dedication and exemplary service to the department, he received the Dean's Excellence Award for the 2004-05 academic year. We are deeply saddened by Eric's passing and will greatly miss him.

Faculty Position

Faculty Position in Energy and Electric Power.

We invite applications for a tenure track faculty position in energy and electric power at the Assistant Professor rank starting September 2011. By date of appointment, the candidate must have an earned Doctorate in Electrical Engineering or a closely related field, with a specialty in energy and power system planning analysis and experience with renewable energy. The candidate will be required to teach undergraduate and graduate engineering courses at the junction of renewable energy resources and their conversion and delivery in electric form and broad based courses for engineers and nonengineers covering renewable and nonrenewable energy sources and their use in the commercial, residential, industrial, and transportation sectors. Some of the courses will be taught state-wide as part of an initiative funded by the University of Maine System and lead by UMaine President Dr. Robert Kennedy. The candidate is also required to establish an active graduate research program in integration of renewables into the electric grid including smart grid technologies **with emphasis on reliability and stability of transmission and distribution systems** and demand management.

This new position is part of a larger University of Maine effort in education and research in renewable energy. This includes deepwater offshore wind, tidal power, biofuels, solar energy, smart grid technologies, and fuel cells. Secretary of Energy Chu designated UMaine's AEWCA Advanced Structures and Composites Laboratory as the National Center of Offshore Wind Research. Maine already has the highest wind power production capacity of any New England state. Our Forest Bioproducts Research Institute is a national leader in converting woody biomass into liquid fuels. UMaine in collaboration with Maine Maritime Academy is developing and deploying tidal turbines as part of DOE funded projects. In collaborations with the major power utilities, we are also leading **efforts in smart grid technologies including dynamical thermal and stability analysis and microgrid**. This new position is essential to tying many of these efforts together thereby allowing integration of greater amounts of renewable energy into the electric grid and to providing essential education in renewable energy.

Interested applicants should submit a letter of application and their resume in PDF format including names and e-mail addresses of three references to Dr. Mohamad Musavi at <http://www.eece.maine.edu/hr/jobs.php> or mail to University of Maine, Dept. of Electrical and Computer Engineering, 101 Barrows Hall, Orono, ME 04469. Review of applications will begin immediately and will continue until the position is filled. For a review of full position description see the following website: <http://jobs.umaine.edu/>. Incomplete applications cannot be considered. Appropriate background checks will be required.

On January 1, 2011, UMaine will join a growing number, now nearly 400, of colleges and universities around the country that are tobacco-free. Implementation follows more than three years of study and planning managed by a committee of faculty members, staff members and students. A good deal of information about UMaine's plan and the new policy is online at <http://umaine.edu/tobaccofree/>.

The University of Maine is an EO/AA Employer.

Publications

Peer Reviewed Publications

W. Zhang, **N.W. Emanetoglu**, N. Bambha, and J.R. Bickford, "Design and Analysis of In_{0.53}Ga_{0.47}As/InP Symmetric Gain Optoelectronic Mixers," Solid State Electronics, Vol. 54, 1549-1553, December 2010.

J. Sutanto, **R. L. Smith** and S.D. Collins, "Fabrication of Nano-Gap Electrodes and Nano Wires Using an Electrochemical and Chemical Etching Technique, Journal of Micromechanics and Microengineering, 20(4) art. 045016, March 2010.

Peer Reviewed Conference Proceedings

Y. Lin and **D.E. Kotecki**, "2.9-30.3 GHz Fourth-Harmonic Voltage-controlled Oscillator in 130 nm SiGe BiCMOS Technology," in Proc. of the IEEE International Conference on Electronics, Circuits and Systems (ICECS) Athens, Greece, pp. 401-404, Dec. 2010.

Y. Lin and **D.E. Kotecki**, "A Voltage-Controlled Oscillator with a 0.8-13.4 GHz Tuning Range in 120nm SiGe BiCMOS Technology," in Proc. of the IEEE International Conference on Electronics, Circuits and Systems (ICECS), Athens, Greece, pp. 431-434, Dec. 2010.

Gifts/Donations

We sincerely appreciate all of the support from our alumni and corporate supporters. Your support of our scholarship programs means a lot to our young and hardworking students.

Industry

Fairchild Semiconductor, \$11,250 for scholarships, Nov. 1
Kepware, \$6,000

Other

Norman Stetson, \$20,000 to establish a scholarship fund
Larry & Kathleen Kazmerski, \$2,500 to the Vetelino Excellence Fund, Dec.29
Victor & Sheryl Jipson, \$2,000
Debra and Denham Ward, \$2,000
Carleton & Iris Brown, \$1,500
Mark Franck, \$1,200
Murthy & Diane Ayyagari, \$1,000
Carroll and Gail Lee, \$1,000 and pledge of \$5,000 total to Carroll R. Lee Scholarship, Dec. 30
Timothy Beaucage, \$300
Edward Johnson, \$250
Aubrey Merrill, \$250

Timothy Osborne, \$250
Ward D. Gerow, \$200, Dec. 2
Malcolm A. Young, \$200
Ronald O. Brown, \$100
Frederick C. Bustard, \$100
Roger D. Gould, \$100, Nov. 15, \$50, Jan.
Leroy Noyes, \$100
Carver L. Washburn, \$100
Miroslav Juric, \$50
Dwight M. Lanpher, \$50
Stacy L. Shaw, \$50

Grants Received

Since December 2010, the ECE faculty has received \$393,079 in grants.

Other

Since December the faculty have submitted two proposals for a total of about \$902,441.