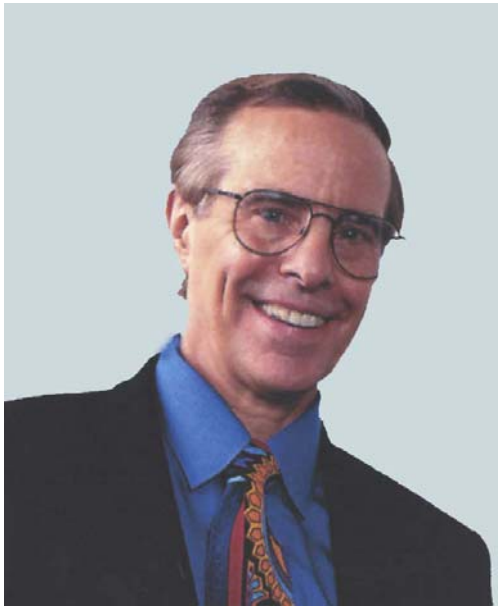
Former Faculty Member Provides Generous Gift to the Department



Former faculty member, Dr. Larry Kazmerski recently received the 2007 prestigious Karl W. Boer award for his contributions to solar energy and has shared his award money with the Electrical and Computer Engineering Department to help students interested in solid state and semiconductors.

Dr. Kazmerski is the Director of the National Center for Photovoltaics at the National Renewable Energy Laboratory in Golden, Colorado. He received his B.S.E.E. in 1967, M.S.E.E. in 1968, and his Ph.D. degree in electrical engineering in 1970—all from the University of Notre Dame. He served in a postdoctoral position at the University of Notre Dame Radiation Research Laboratory (Atomic Energy Commission) from January through August 1971, and was on the electrical engineering faculty of the University of Maine before going to SERI (NREL) in 1977. His research at Maine included NSF- and ERDA-funded work in thin-film photovoltaics and the report of the *first* thin-film copper-indium-diselenite (CIS) solar cell. He was SERI's first staff member in photovoltaics, hired specifically to establish efforts in the characterization of photovoltaic materials and devices, he led NREL efforts in measurements and characterization for more than 20 years. He has held adjunct professorships at the University of Colarado, Colorado School of Mines, and the University of Denver.

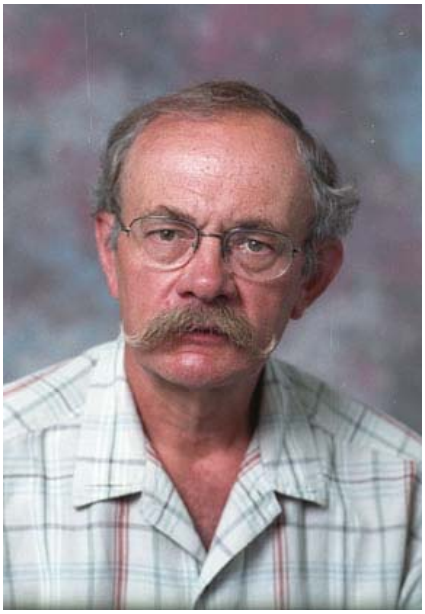
Dr. Kazmerski has published over 300 journal papers in the areas of solar cells, thin films, semiconductor materials and devices, surface and interface analysis, molecular beam epitaxy, semiconductor defects, scanning probe microscopy, nanoscale technology, high-temperature superconductivity, solar and photovoltaics technologies, and solar hydrogen. He has authored or edited four books, and serves on the editorial boards of several journals, and has more than 160 invited presentations at international conferences, workshops, and seminars. He was co-founder and editor of the journal *SOLAR CELLS*, published by Elsevier-Sequoia (1979-1991). Kazmerski is Editor-in-Chief of the Elsevier journal, *Renewable and Sustainable Energy Reviews*. He also has four **R&D 100 Awards**.

He is active in the IEEE, AVS, MRS, APS, ISES, and ASES. Kazmerski was the recipient of the **Peter Mark Memorial Award** of the AVS in 1981 and IEEE **William R. Cherry Award** in 1993. He has received several international recognitions for his work in solar photovoltaics. Kazmerski is a *Fellow* of the Institute of Electrical and Electronics Engineers (IEEE), a *Fellow* of the American Physical Society (APS), a *Fellow* of the AVS, and a *Fellow* of the International Energy Foundation (IEF). His is a *Distinguished Lecturer* of the AVS (1999-present). In 2000, Kazmerski was recognized as a **Honorary Member** of the AVS for his contributions to science

and the Society. Kazmerski was elected as a member of the *National Academy of Engineering* in 2005. Recently, he received the **World PV Award** from the international PV communities representing the Europe, Asia-Pacific, and the U.S. for outstanding leadership and contributions to the worldwide advancement of photovoltaic science and technology. In September 2006, he received of the *Nelson W. Taylor Award for Materials Science* by Penn State University. He is the recipient of the 2008 ASES **Charles Greeley Abbot Award** for significant contributions to the field of solar energy.

In recognizing the ECE faculty, Dr. Kazmerski says of Dr. John Vetelino "there are few people I have met in my life who have been so unselfishly dedicated to students and to research. I have met so many of your (and my) former students who always ask, "How's Vet? Do you ever see him?" "I hope that these funds can be used by you and the Department of Electrical Engineering to help guide more students into technology careers."

Sensor Receives Notable Achievement from the National Science Foundation



A sensor developed by John F. Vetelino (Professor, Electrical and Computer Engineering) and his research team to detect the presence of dangerous chemical and biological agents has been chosen as one of the National Science Foundation's notable achievements for 2008.

The sensor is fairly simple, but it has a variety of uses. It is about the size between a quarter and a half dollar and is made of quartz. It could help detect peroxide-based explosives, potentially deadly E. coli, and saxitoxin created by red tide that can reach dangerous levels in shellfish.

"It surprised us that it hadn't been uncovered earlier," Dr. Vetelino said. "It's a very simple device."

Potentially, it could be used by restaurants to ensure meats are cooked properly, by airport security officials to detect explosives, and by marine biologists checking for water contamination.

Dr. Vetelino began working on the sensor four years ago and has received grants from the National Science Foundation (NSF) to continue working on the project. UMaine now has patented the sensor and is working to commercialize it. For this project, Vetelino's research was assisted by ECE graduate students Lester French, Don McCann, Mitchell Wark, Jason McGann, Shane Winters and Chris Sgambato. Other research personnel who worked on the project included David Frankel, Laboratory for Surface Science and Technology senior research scientist, Carl Tripp, Professor of Chemistry, Paul Millard, Associate Professor of Chemical and Biological Engineering, and David Neivandt, Associate Professor of Chemical and Biological Engineering

Their work has been awarded an NSF Small Business Innovation Research (SBIR) grant, an NSF Small Technology Transfer Research (STTR) grant and two US Department of Agriculture (USDA) grants totaling over $400,000 toward commercialization of the sensor. Dr. Vetelino has also received $400,000 in September 2007 from NSF to develop a sensing element to detect peroxide-based explosives that can be made with common ingredients found in any hardware store.

Dr. Vetelino said there is an application under review by the National Institute of Health (NIH) for an additional $500,000, and another $250,000 grant application has been submitted to the Maine Technology Institute. "We're hopeful that we'll get some of this funding," Vetelino said.

NSF will use Vetelino's sensor work and other noteworthy research efforts around the country to demonstrate to the public and Congress the important scientific activity supported through its federal-funding program.

Taking the Heat

Keeping your car running at peak performance can be expensive and time consuming. Imagine the level of maintenance required to make the extraordinarily complex engines in military aircraft operate without a hitch.

A typical gas turbine jet engine can reach temperatures of more than 2,000 degrees Fahrenheit, with red-hot metal parts spinning at a nearly unfathomable rate. Determining when a critical component might be nearing the end of its useful life under such extreme conditions is difficult, which means that mechanics typically must tear apart the engine and replace parts to ensure an aircraft's readiness and safety at all times.

The Department of Defense (DoD) recently decided that all of its new aeronautical and aerospace systems should be monitored continuously, using sensor technology that can automatically assess the health of the components and reduce costly manual inspections. The problem is that the high temperatures a jet engine generates can break down the diagnostic sensors, rendering them ineffective when things really get hot in flight.

But now researchers in the UMaine's Laboratory for Surface Science and Technology (LASST) believe they have developed the first sensor that truly can take the heat. The high-temperature acoustic wave sensor, which is a few millimeters in size, is made of new materials that allow it to function at about 1,000 degrees Celsium (1,832 degrees F) and possibly much higher.

The sensors will be targeting temperature, pressure, vibration and corrosion in the engines, and determining the probability of failure of the

parts over time so they could be used longer," says Mauricio Pereira de Cunha, Associate Professor of Electrical and Computer Engineering and member of LASST. "The Air Force is very interested in this technology because it would potentially help save more than $1.6 billion in engine maintenance costs, and free up Air Force money to renovate the fleet."

Until now, the devices had never been used successfully at very high temperatures because of the limits of their mataerials. Pereira de Cunha and Robert Lad, Physics Professor and Director of LASST, are confident that the new materials used in their sensors will change all that. (Full Story).

Maine STEM Held Day-Long Summit to Improve Education

ECE Faculty *Yifeng Zhu, Bruce Segee*, and Associate Dean *Chet Rock* met Maine Commissioner of Education *Susan Gendron* during the Maine STEM Summit at the Augusta Civic Center on January 24, 2008 (from left to right).

Dr. Bruce Segee and Dr. Yifeng Zhu, along with Dr. Chet Rock, Associate Dean of College of Engineering, have participated in a statewide day-long summit that aims to improve the education of science, technology, engineering and mathematics (STEM) in Maine and to build collaborations between educators, business people and legislators. Governor Baldacci, former Governor King, and University Chancellor Pattenaude gave speeches in the summit and raised awareness of the vital connection between STEM education and Maine's future economic prosperity.

The summit praised Dr. Segee and Dr. Zhu's current efforts in STEM education, particularly the project that links Maine's middle school laptop program with UMaine Supercomputers. Drs. Segee and Zhu are leading a three-year program titled "Inquiry-based Dynamic Earth Applications of Supercomputing, Seeing the Big Picture with Information Technology". This program, sponsored by National Science Foundation under a $1.2M research grant, will expose middle school teachers and students to large-scale numeric models running on UMaine

supercomputers with over 500 processors. The goal of this project is to stimulate students' interests in STEM by directly placing them in the frontier of information technology and scientific discovery.

UMaine President Robert Kennedy states, "There is growing appreciation for the importance of these critical disciplines statewide, and UMaine people are very involved in numerous important initiatives that will help young people learn and excel in those academic areas.

SuperMe

Bruce Segee and Yifeng Zhu, co-PI's on a proposal sponsored by the National Science Foundation (NSF) and the Department of Defense (DoD) will be hosting a research experience for undergraduates (REU) program the Summer of 2008. The REU program entitled, "Supercomputing Undergraduate Program in Maine (SuperMe) will provide scientific exploration ranging from engineering to sciences with a coherent intellectual focus on supercomputing. The REU site will provide a ten-week summer research experience for ten undergraduates each year for three years. With integrated expertise of ten faculty research from both computer systems and domain applications, SuperMe allows each undergraduate to conduct meaningful research, such as developing supercomputing techniques and tools, and solving cutting-edge research problems through parallel computing and scientific visualization.

The program will consists of a $4,000 stipend plus housing, dining and travel support and will run from May 27 until August 1.

Girls Night Out

In January, the National Science Foundation GK-12 Sensors! program under the direction of John Vetelino hosted "Girls' Night Out," an event to inspire middle school girls to pursue careers in math and science. More than 30 girls from the William S. Cohen and James Doughty Middle schools in Bangor, Maine participated in the event. The girls were selected because of their math and science abilities.

Professor Vetelino said the idea for the event came from middle school teachers Trisha Bernhardt and Tracy Vassiliev, and Jason Bolton, a GK-12 Sensors Fellow. Trisha and Tracy participated in the NSF Research Experience for Teachers (RET) program at the University of Maine in the 2006 summer under the direction of John Vetelino. The RET program selects teachers from the surrounding Bangor area during the summer, showing them how to integrate cutting-edge technology into the classroom.

A tour of UMaine's research facilities and labs was followed by talks from Dana Humphrey, Dean of the College of Engineering and Cindy Blodgett, UMaine Women's basketball coach.

The girls participated in a panel discussion lead by eight women. "It was very enlightening," Vetelino said. Heidi Purrington, a senior electrical engineering major who participated in the

panel, said it was important to show girls that science was not about suspenders and beakers. "It was great to reconnect with them. It was an opportunity that would have been exciting for me," Purrington said. After the panel the girls formed small groups to interact with panel leaders for an informal discussion.

At the end of the evening, the girls were treated to a UMaine women's basketball game. Several girls were chosen to compete in the halftime shooting contest. UMaine has given tours of campus facilities but has not had an event like this, said Vetelino. "It offers an excellent vehicle to use to get kids excited about science."

Dedication of the Allison Whitney Laboratory

The dedication of the Allison I.Whitney Electronics Laboratory will be held on Tuesday, April 29, 2008 at 3:00 p.m. in the Engineering Science Research Building Arthur St. John Hill Auditorium. We would like to welcome you to join us. There will be light refreshments and parking will be available in the Bennett Hall lot. If you plan to attend, please RSVP by April 18th to Janice Gomm at 207-581-2223 or through email at: janice @eece.maine.edu.

Gifts/Donations

William Lambert, $20,000 to the Lambert Family Scholarship
Lawrence Kazmerski, $10,000
Norman and Dorothea Stetson, $1,000
The Xerox Foundation matching gift (Robert Stewart), $1,000

Grants Received

A. Abedi, "IR Sensor Network for Biological Research," $3,800, Biology Department, January 1.

A. Abedi, "Mobile Media Antenna Software Planner," $25,000, Dielectric Co., January 22.

A. Abedi, "Travel Grant to attend Second GENI Engineering Conference, $1,600, NSF, February 7.

A. Abedi, NASA Summer internship for three undergraduate students, $20,250, February 27.

Publications

Peer Reviewed Journals

J.F. Vetelino, U. Hempel, R. Lucklum, and P. Hauptmann, "Advanced Application of the Impedance Spectrum of a Lateral Field Excited Sensor," Sensors & Actuators: A. 142, pp. 97-103. 2008.

Y. Zhu, H. Jiang, J. Wang and F. Xian, "A Novel Distributed Metadata Management System for Large Cluster-based Storage", IEEE Transaction on Distributed and Parallel Systems, Vol. 19, No. 4, pp. 1-14, April 2008.

Other

Since February the faculty have submitted six proposals for a total of about $3,490,000.

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