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## Outshining Edison: New NSF Engineering Research Center To Advance "Smart Lighting"

### Rensselaer to host \$18.5 million ERC dedicated to energy-efficient lighting and photonics

A new research center at Rensselaer Polytechnic Institute, funded by a five-year, \$18.5 million grant from the National Science Foundation, aims to supplant the common light bulb with next-generation lighting devices that are smarter, greener, and ripe for innovation.

"Sustainability and energy efficiency are two key challenges of our time, yet they also present rich opportunities," said Rensselaer President Shirley Ann Jackson. "With innovation, ingenuity, and a clear vision, the NSF-funded Smart Lighting Center at Rensselaer will rewrite the rules for manipulating light and help introduce these new green technologies to the world. This project is a shining example of academia, the federal and state governments, and industry working together to advance the state of science and engineering, while creating new opportunities for students, faculty, and businesses."

The Engineering Research Center for Smart Lighting will be the only NSF engineering research center based in New York state. Funded by the NSF, industry, New York state, and led by Rensselaer with partners Boston University and the University of New Mexico, the Smart Lighting Center will investigate and develop light-emitting diode (LED) technologies that could one day change the way we illuminate our world. Along with significant energy savings for lighting homes and offices, these technologies will open doors to a diverse spectrum of new applications impacting everything from biotechnology and transportation to computer networking and displays.

The project is expected to receive up to \$50 million in funding over the next 10 years. The bulk of this funding will come from the NSF, with additional support from New York state, Rensselaer, and 18 industrial partners. NSF funding began in September with \$3.25 million for the center's first year, a figure forecast to increase over the next several years. New York has committed \$700,000 to the center's first year, and first-year funding from industrial partners is expected to approach nearly \$1 million. Rensselaer is committing more than \$500,000 to help launch the center.

The new research center will concentrate on three primary research thrusts, said E. Fred Schubert, Wellfleet Senior Constellation Professor of Future Chips at Rensselaer, who leads the center. A multidisciplinary team will focus on developing novel materials, device technology, and systems applications to further the understanding and proliferation of smart lighting technologies.

Twenty faculty researchers from Rensselaer, along with 10 researchers from partners Boston University and the University of New Mexico, will staff the new center. Students, postdoctoral researchers, and visiting industry engineers will also be regular contributors to the research conducted at the Smart Lighting ERC.

"I am delighted to welcome RPI to the ERC 'family' as a lead institution for the NSF ERC for Smart Lighting," said Lynn Preston, the leader of the Engineering Research Centers Program at NSF. "The Smart Lighting ERC is the first in our extensive portfolio of ERCs in optics and electronics that focuses on advancing LED technology for new lighting systems that will have the capacity to deliver increased functionality in displays, transportation, and communication systems with significant savings in energy use. This ERC joins four other new ERCs in the ERC Class of 2008, the start of the third generation of over 50 ERCs established since 1985. Like all ERCs, these Gen-3 ERCs will rest on the proven capacity of ERCs to strengthen our economy by advancing knowledge and technology and educating engineers who are leaders in advancing technology."

"We applaud the researchers at RPI for this prestigious award. Not only will this help the state and nation achieve our energy efficiency objective, it will also advance our economic objectives by establishing a technology leadership position in an area with tremendous commercial opportunities," said New York State Foundation for Science, Technology and Innovation Executive Director Edward Reinfurt.

"Our participation in this center offers a chance for our engineering students and faculty to create energy-saving technologies that will improve our society and create new business opportunities," said University of New Mexico President David Schmidly. "We are particularly excited that this program will also have a strong focus on outreach, and we anticipate that the new field of smart lighting will increase the number and diversity of students entering science, math, and engineering education."

"Smart Lighting offers the potential to reshape and advance wireless communications technology," said Boston University College of Engineering Dean Kenneth R. Lutchen. "We are very proud and excited about the world-renowned photonics and systems engineering faculty at Boston University that will contribute their creativity and expertise to make this technology a reality."

Along with broadening the knowledge base of smart lighting, Schubert expects the center to be a hub for commercializing related technology, where students and academic researchers work side-by-side with companies large and small to test, validate, and bring new products to the marketplace.

"This new center will energize the field of photonics, and it reinforces the vision that smart light sources will soon antique Thomas Edison's light bulb," Schubert said. "The Smart Lighting ERC will also be a catalyst for developing and realizing new, yet unexpected applications for photonics."

At the heart of smart lighting are powerful techniques to control the basic properties of light. With recent breakthroughs in the first true anti-reflective coating, nano-emitter growth, in the unprecedented control of the refractive index of materials, and the demonstration of the first viable polarized LED-based light sources, researchers are now better able to control almost every aspect of light.

"The capabilities of smart lighting surpasses and transcends the abilities of conventional lighting," Schubert said. "With smart lighting, we have absolute control over every aspect of the light, from polarization to temporal modulation and spectral composition. We can custom tailor a light source for nearly any imaginable scientific or commercial application."

By allowing humans to better support their natural circadian rhythm, smart lighting holds the promise for reducing individuals' dependency on sleep-inducing drugs, and even reducing the risk of certain types of cancer.

Along with Rensselaer and core partners BU and UNM, outreach partners for the new ERC are Howard University in Washington; Morgan State University in Baltimore; and Rose-Hulman Institute of Technology in Terre Haute, Ind. Additionally, Chonbuk National University in Korea; National Chiao Tung University in Taiwan; Taiwan National University; and Vilnius University in Lithuania will support the Smart Lighting ERC with expertise and international perspectives.

The ERC's 18 industry partners, ranging from major lighting companies to small start-up firms, were enlisted to help guide strategic planning, spur innovation, and provide university students with first-hand experience in entrepreneurship as well as corporate research and development. To facilitate and stimulate technology transfer, the ERC will also partner with the Center for Economic Growth in Albany, N.Y., the Optoelectronics Industry Development Association, and small business incubators at each of the partner universities.

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