



## Press release

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## **SPIE counts advances in sustainable photonics on list of solutions to celebrate on Earth Day**

*Photonics applications that enhance sustainable living opportunities, enable monitoring of climate change and its environmental impacts, and solve many other environmental challenges are among achievements to celebrate on Earth Day, Monday 22 April, say event organizers at SPIE, the international society for optics and photonics. And researchers in the field say they are happy to see the keen interest in “green” technologies on the part of young researchers.*

BELLINGHAM, Washington, USA, and CARDIFF, UK – 18 April 2013 –Events around the world will celebrate Earth Day on Monday 22 April, drawing attention to global challenges such as adapting to climate change, generating renewable energy, and attaining sustainability in everything from local food sources to investment choices. Photonics technologies, powerful drivers behind advances in every facet of life, are demonstrating their “green” nature as well, noted event organizers at [SPIE, the international society for optics and photonics](#).

Sustainable photonics are at work in the form of photovoltaics for generating energy from sunlight, solid-state lighting (SSL) for cheaper, more efficient, longer lasting light sources, sensors to detect ocean temperatures and monitor the effect on fish populations, and numerous other applications.

An annual conference on sustainable photonics held at SPIE Photonics West in San Francisco highlights papers in which research in the field enables development of new technology that can improve standards of living and save money and resources. To emphasize the importance of this research, this year SPIE recognized four papers with Green Photonics Awards.

“Photonics innovations enable improved sustainable products and services worldwide. The winners of this year’s Green Photonics Awards are exemplary in this regard,” said Stephen Eglash, Executive Director of the Energy and Environment Affiliates Program at Stanford University, and founder and chair of the green photonics symposium. “Each of the winning papers provides new information to help solve existing problems using photonics.”

Published award papers are available for free download in the SPIE Digital Library through 31 July; follow the links below.

## Next-generation lighting

SSL utilizing light-emitting diodes (LEDs) is the new industry standard for energy efficiency, and the rapid development of LEDs has flooded the lighting market, Eglash said. LEDs are efficient and long-lived sources for general lighting, but commercially available products exhibit variable quality.

**Carsten Dam-Hansen** and Technical Univ. of Denmark colleagues **Anders Thorseth**, **Dennis Corell**, and **Peter Poulsen** tested a large number of LED lamps to evaluate quality and lifetime, as reported in their paper "[Light quality and efficiency of consumer grade solid state lighting products](#)" (PDF 780 kB).

"It is the project group's hope that we internationally can work together on test and characterization so the data can be shared all over the world to benefit the individual nation importing or producing the products," Thorseth said.

## Cheaper solar power

High-efficiency solar cells are needed to decrease the cost of solar energy, Eglash said. Solar cells that use thin absorber layers cost less and require less of the Earth's materials. But inefficiencies of conventional light trapping techniques limit the ability to reduce the thickness of thin-film solar cells.

In one of two papers recognized in this area, "[The photovoltaic potential of femtosecond-laser textured amorphous silicon](#)" (PDF 379 kB), authors **Meng-Ju Sher**, **Benjamin Franta**, **Kenneth Hammond**, **Lysander Christakis**, and **Eric Mazur** of Harvard University told how they used femtosecond laser texturing to reduce reflection and enhance light absorption, enabling high efficiency from thin absorbers.

**Clément Colin** of the Lab. de Photonique et de Nanostructures, an author of the other winning paper in the category, explained that his team used "new light-trapping strategies for broadband absorption in ultra-thin solar cells. These results allow at least a tenfold thickness reduction of the absorber, and pave the way to novel architectures for thin-film and high-efficiency photovoltaic technologies."

Colin's co-authors for the paper "[Broadband light trapping in ultra-thin nano-structured solar cells](#)" (PDF 2 MB) are **Inés Massiot**, **Andrea Cattoni**, **Nicolas Vandamme**, **Christophe Dupuis**, **Nathalie Bardou**, **Jean-Luc Pelouard**, and **Stéphane Collin** of the Lab. de Photonique et de Nanostructures; **Isabelle Gérard**, of the Univ. de Versailles Saint-Quentin-en Yvelines; and **Negar Naghavi** and **Jean François Guillemoles** of the Institut de Recherche et Développement sur l'Energie Photovoltaïque.

## Reduced electricity for computing

Optical interconnects, considered a good solution for many of the challenges in designing and building computing systems, can reduce the electrical power needed for communication and computation, Eglash said. But board-level integration of optical interconnects is problematic.

In their winning paper, "[Hybrid polymer optical waveguides written by two-photon processing for 3D interconnects](#)" (summary; PDF 16 kB), **Ruth Houbertz-Krauss**, **Sönke Steenhusen**, and **Timo Grunemann** of Fraunhofer Institut für Siliciumforschung, illustrated how they were able to considerably simplify the fabrication of optical interconnects, resulting in both environmental and energy-saving benefits.

## Engaging the next generation

One of the many future promises of sustainable photonics research is its attraction for younger students, noted Sher, whose co-authors included a high-school student and an undergraduate. “The most exciting thing for me is the opportunity to engage young researchers,” she said. “We are excited that young students are interested in energy materials.”

**SPIE** is the international society for optics and photonics, a not-for-profit organization founded in 1955 to advance light-based technologies. The Society serves nearly 225,000 constituents from approximately 150 countries, offering conferences, continuing education, books, journals, and a digital library in support of interdisciplinary information exchange, professional networking, and patent precedent. SPIE provided over \$3.2 million in support of education and outreach programs in 2012.

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Links:

SPIE, the international society for optics and photonics: <http://spie.org>

SPIE Digital Library: <http://spiedigitallibrary.org>

“Light quality and efficiency of consumer grade solid state lighting products”:  
<http://proceedings.spiedigitallibrary.org/proceeding.aspx?articleid=1660963>

“The photovoltaic potential of femtosecond-laser textured amorphous silicon”:  
<http://proceedings.spiedigitallibrary.org/proceeding.aspx?articleid=1658858>

"Broadband light trapping in ultra-thin nano-structured solar cells":  
<http://proceedings.spiedigitallibrary.org/proceeding.aspx?articleid=1672482>

“Hybrid polymer optical waveguides written by two-photon processing for 3D interconnects”  
(summary):  
<http://spie.org/Documents/AboutSPIE/Fraunhofer-GreenPhotonicsAward2013-Houbertz-etal.pdf>