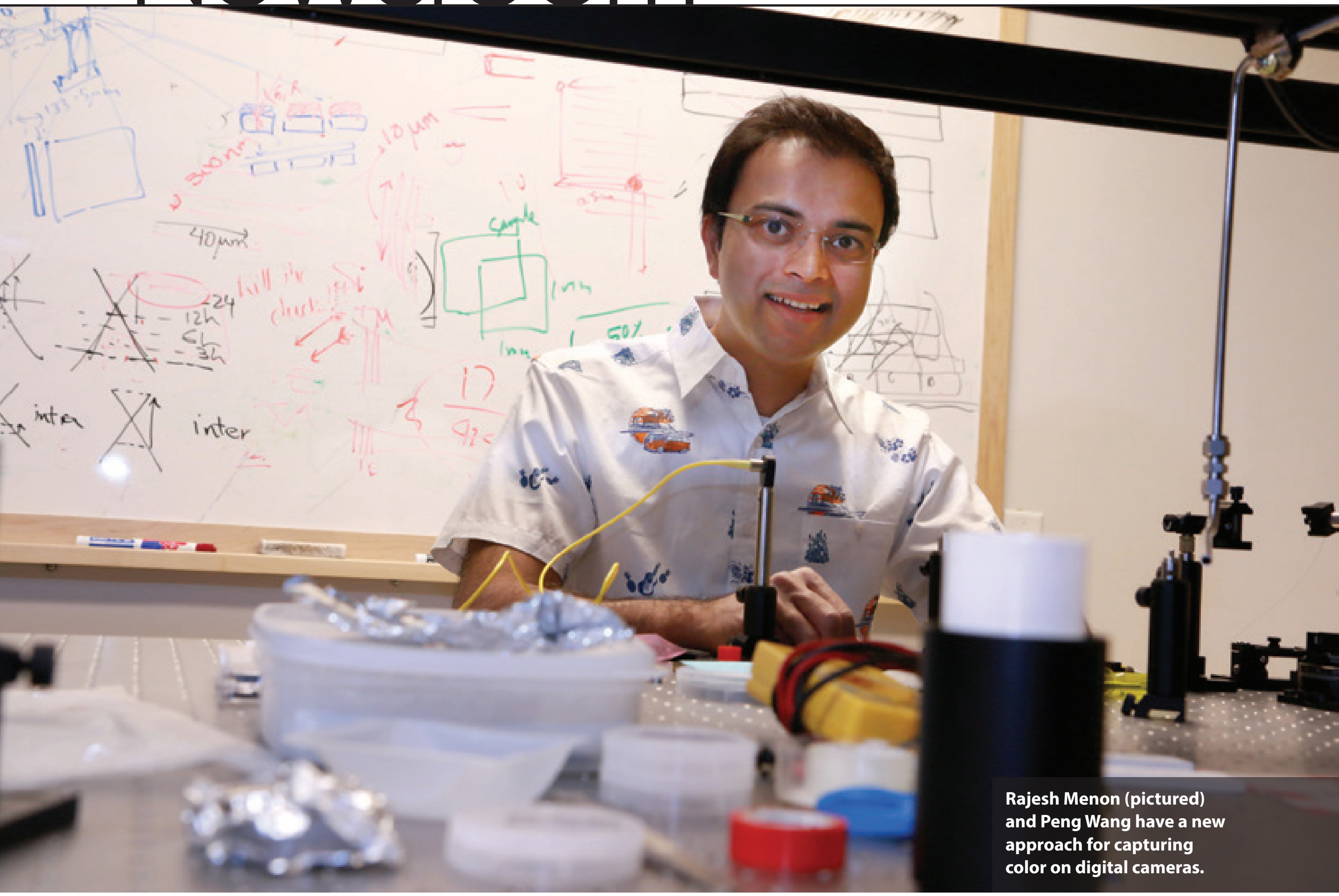


Rajesh Menon (pictured) and Peng Wang have a new approach for capturing color on digital cameras.

Dan Hixson / University of Utah

DISPLAYS

Toward Sharper Photos in Low Light

A diffractive filter and computational optics could boost smartphone camera sensitivity

The smartphone camera is a miracle of miniaturization and technology. But even these cameras don't perform that well in low-light situations, in which the images captured can be dark, uneven and grainy.

"Low-light photography is not quite there yet," says Rajesh Menon, a professor of electrical and computer engineering at the University of Utah (USA). And, along with grad student Peng Wang, Menon has proposed a way to fix that: a transparent, diffractive color filter for the camera, and computational optics to back out the true colors from the diffracted filter signal (Optica, doi: 10.1364/OPTICA.2.000933). Each pixel in the sensor array is overlain by a unit cell of a transparent filter array that diffracts incident light into an intensity pattern on the sensor. The pixel color for the final image is then backed out through a computer algorithm.

A big advantage of the system for low-light situations is that it allows substantially more light to get to the image sensor; Wang and Menon say their experiments revealed that the sensitivity can be enhanced by a factor as high as 3.12 times. The filter also should be easy to manufacture, according to the team, as it's fabricated with standard grayscale lithography and imprinting techniques.

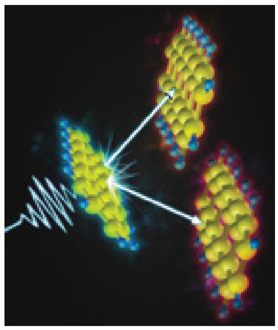
In addition to smartphones, the technology could also have applications in single-shot hyperspectral imaging, drones and self-driving cars. —*Stewart Wills*

www.osa-opn.org/news/pixel_color

QUANTUM

"Two-for-One" Fission for Solar Cells

An international team of scientists has observed how certain organic molecules can split a single photon into two molecular excitations—a quantum-mechanical process that could boost the efficiency of future solar cells (Nature Chem., doi: 10.1038/nchem.2371).



L.W. Chin, D. Turban and A.W. Chin

Researchers in the Cavendish Laboratory at the University of Cambridge (U.K.) used ultrafast laser pulses to study the creation of spin-triplet excitons through a process called singlet fission. The group prepared films containing derivatives of pentacene, a material known to undergo singlet fission, and subjected the samples to 2-D electronic photon echo spectroscopy. The high time-resolution of this spectroscopic technique allowed the researchers to tease out the intermediate states in the quantum process.

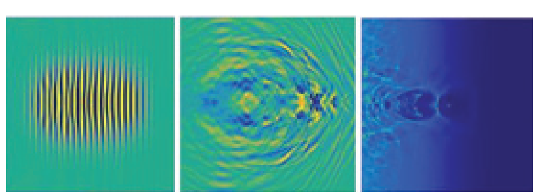
Among their findings, the researchers learned that the vibrational modes of the molecules create brief superposed states of a singlet exciton and a triplet exciton pair. The triplet excitons had been "dark" to previous observational techniques, but the laser spectroscopy revealed their weak signature. *—Patricia Daukantas*

www.osa-opn.org/news/fission

LASERS

Toward Portable Particle Accelerators?

Researchers at the University of Maryland's Institute for Research in Electronics and Applied Physics (USA) announced a breakthrough in electron acceleration that they suggest could enable truly portable particle accelerators for low-dose cancer therapy, medical imaging and isotope production (Phys. Rev. Lett., doi:10.1103/PhysRevLett.115.194802). The technology involves the use of record-low-energy ultrashort laser pulses to accelerate electrons in a hydrogen plasma to nearly the speed of light.



Howard Milchberg and George Hine

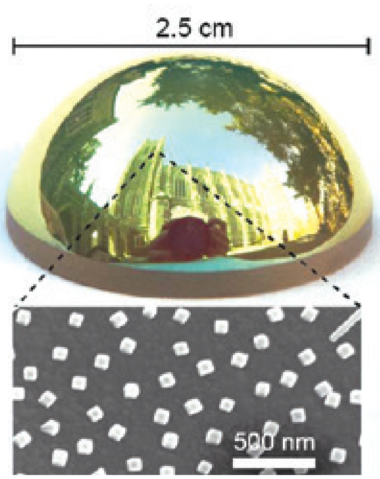
Laser pulses drive a plasma wake in a jet of cold hydrogen, generating a relativistic electron beam with energies of two to 12 MeV (see image). Associated with the electron beam are the ultrashort flashes of light that contain as much as three percent of the initial pulse energy, which is much more efficient than previous studies produced. Furthermore, the technique uses only millijoules of energy, which is much less energy than previous studies required. *—Valerie C. Coffey*

www.osa-opn.org/news/plasma_wake

MATERIALS

Near-Perfect-Absorption **Metasurfaces**

Spectrally selective light absorbers are used in a wide range of advanced photonic applications—but producing large-area metasurfaces for near-perfect absorption has been an expensive proposition. A team of scientists from Duke University (USA) has now reportedly come up with a simple, scalable chemical technique for creating such metasurfaces, using deposition of silver nanocubes atop a layered metal-polymer foundation (Adv. Mater., doi: 10.1002/adma.201503281). The result, according to the team, is "truly macroscopic," near-perfect-absorption metasurfaces that are tunable from the visible to the near-infrared.

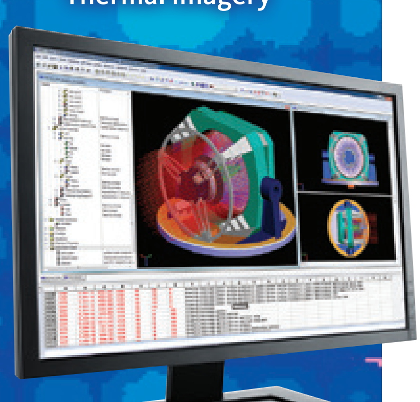


A curved surface acts as a near-perfect absorber of red light.
M. Mikkelsen and G. Akselrod / Duke University

The combination of precise spectral selectivity and large-area fabrication could, according to the Duke researchers, make the new metasurfaces directly applicable to incorporation into imaging and photodetection technologies. They also raise the prospect of creating more active devices—such as highly sensitive infrared imaging systems—by integrating the metasurfaces with semiconductors and harvesting the "hot" electrons generated in the metal resonators to generate an electrical signal. "That's the next step," says postdoc and lead author Gleb Akselrod. —*Stewart Wills*

www.osa-opn.org/news/abosrbers

Coherent beam propagation
Stray light analysis
Illumination and non-imaging optical design
Imaging system analysis
Multi-wavelength characterization
Thermal imagery



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INDUSTRY

SFU and Hanhai Forge "Accelerator" for Emerging Tech

Simon Fraser University (SFU), Vancouver, Canada, announced that it has signed a memorandum of understanding with the technology investment management group Hanhai Zhiye, Beijing, China, to launch a new initiative to accelerate growth and commercialization of technologies jointly developed in the two countries. The initiative, dubbed the China-Canada Commercialization and Acceleration Network (C2-CAN), has the stated goal of supporting commercialization of advanced tech originating from the two countries, as well as helping entrepreneurs and innovators to tap cross-border connections and resources.

On the SFU side, C2-CAN marks the latest step in "SFU Innovates," a suite of university initiatives that seek to "inspire, develop, and support impact-driven innovation and entrepreneurship." The accelerator will reside in Vancouver within the university's VentureLabs program, which is part of a pan-Canadian accelerator network operated with two other universities.

Hanhai Zhiye focuses on science and technology park construction and development, and is seeking to "build an international science and technology service platform that hatches globally for cross-border acceleration." Hanhai has forged accelerator and incubator partnerships in the United States and Germany, as well as five large national science and technology incubators within China itself. —*Stewart Wills*

GSI Group to Acquire Lincoln Laser in US$11 Million Deal

The GSI Group in Bedford, Mass., USA, a supplier of laser, precision-motion and vision technologies to original equipment manufacturers in medical and advanced industrial applications, announced an agreement to acquire ultrafast scanning equipment provider Lincoln Laser Company of Phoenix, Ariz., USA, for US$11 million in cash. Lincoln Laser's business will integrate with the operations of Cambridge Technology, a GSI business group located in Bedford. —*Valerie C. Coffey*

The Road to OSA's Centennial

The Optical Society (OSA) celebrates its 100th anniversary in 2016. To commemorate this special occasion, the society is planning a number of activities and events. Check the OSA Centennial website for information about how you can join the celebration: www.osa.org/100

1916 **Perley G. Nutting is chosen OSA's first president. At its founding, the Society counts 30 members.**

1921

OSA holds its sixth annual meeting in Rochester, N.Y., USA, and enjoys a record attendance of 130 members.

1966

OSA's 50th Anniversary Meeting is held at the Smithsonian Museum in Wash., D.C., USA, with OSA President Van Zandt Williams in attendance.

1986

OSA elects its first female president, Jean M. Bennett, a highly decorated research physicist recognized for her contributions to the study of optical surfaces.

1991

OSA celebrates its 75th anniversary under the leadership of OSA President John N. Howard, founding editor of *Applied Optics*, and OSA's principal historian.

2006

At OSA's 90th annual meeting, OSA Honorary Member and Nobel Laureate Steven Chu delivers a warning on greenhouse gases and global warming.

2016

Today, OSA counts 19,000 members from 100 countries, as well as a global network of 350 Student Chapters.

Images: OSA Archives
Infographic by Sarah Michaud and Alessia Kirkland

OSA The Optical Society | 100 Since 1916

tweeted

@drskyskull (Greg Gabor)

They tried opening a Heisenberg Cafe, but nobody could figure out exactly where it was.

@DRMRFrancis (Matthew R. Francis)

The mind is spinning its wheels in the mud of night. #TeamInsomnia

@SarcasticRover Going to Mars is hard. It's all, like, where to land? What to science? How many fruit roll-ups are you allowed? Also how do you not die?

LENSES

Flexible Fresnel Microlenses

University of Wisconsin – Madison (USA) engineer Hongrui Jian and colleagues took inspiration from the dome-shaped compound lenses of insect eyes to create tiny, flexible Fresnel lens arrays that provide a 170-degree field of view at a fraction of the size of traditional lenses (Sci. Reports, doi: 10.1038/srep15861). The Fresnel zone plates (FZPs) consist of several 0.5-mm-diameter lenses embedded in a sheet of flexible plastic. In addition to the FZPs' flexibility, the lenses themselves are tunable—a feat not possible with rigid refractive lenses. The engineers say their FZPs could prove useful in medical imaging, contact lenses and surveillance cameras.

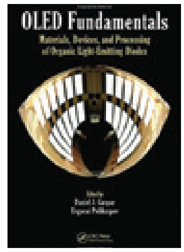
iStock

They demonstrated their FZP design's ability to provide high-resolution imaging of objects located at different axial and angular positions—including university mascot Bucky Badger and a butterfly printed on an transparency—by placing a half-cylindrical array in front of a microscope lens. Images from individual lenses were captured using a CCD camera and stitched together to produce clear, panoramic fields of view. —*Sarah Michaud*

www.osa-opn.org/news/microlens

BOOK REVIEWS

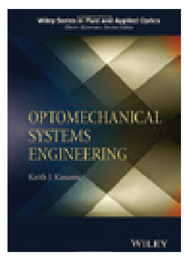
OLED Fundamentals



D.J. Gaspar and E. Polikarpov, eds.; CRC Press, 2015

The editors cover suitable substrates for OLEDs and materials and device issues pertinent to fabrication. The book carefully treats the fundamentals of OLED operation, but it covers practical methods as well. Most of the text is devoted to materials and the remainder to devices and processing. There's also a special feature on the delineation of device and processing challenges. —*K. Alan Shore*

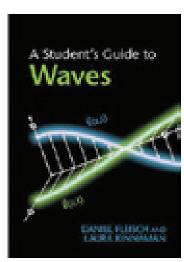
Optomechanical Systems Engineering



K.J. Kasunic; Wiley, 2015

Kasunic's book makes an important contribution to the growing monograph literature on optomechanical engineering and design. The author emphasizes engineering and alignment issues of optical system components. The book also contains discussions of the thermal management principles and vibrational issues that are crucial to optical system design. It would be a good resource for engineers and research students entering the field. —*Christian Brosseau*

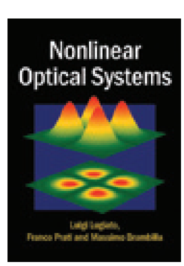
A Student's Guide to Waves



D. Fleisch and L. Kinnaman; Cambridge Univ. Press, 2015

I recommend this supplementary textbook as a clear tutorial for the basic concepts of waves and the wave equation with its applications to mechanics, electromagnetic waves and the Schrödinger equation. The authors focused on the difficult concepts that perplex students. It is written for undergraduates in physics and engineering, but it also has exceptional value to a wider readership. —*Barry R. Masters*

Nonlinear Optical Systems

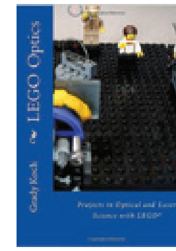


L. Lugiato et al.; Cambridge Univ. Press, 2015

This well-organized book covers a broad spectrum of subjects, including special topics in laser physics, quantum electronics and nonlinear optics, as well as laser emission, frequency generation, solitons, optically bistable systems, pulsations and chaos and optical pattern formation. It is concise, with many references and some unpublished works. The reader will gain an in-depth familiarity with the field. —*A. Zakery*

Visit www.osa-opn.org/books for additional book reviews.

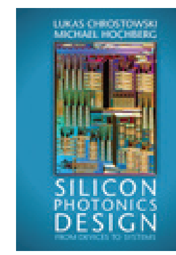
LEGO Optics



G. Koch; CreateSpace, 2014

Many of us have played with LEGO blocks as kids. This book goes a step further by showing how to incorporate LEGO parts into our optics projects. The book is well-illustrated with color diagrams and gives step-by-step instructions for projects such as a LEGO laser, Michaelson interferometer, holography and custom color LED light bricks. The author emphasizes the projects, not theory. —*Vengu Lakshminarayanan*

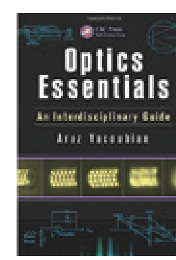
Silicon Photonics Design from Devices to Systems



L. Chrostowski and M. Hochberg; Cambridge Univ. Press, 2015

Many authors have contributed chapters in their areas of expertise for this book, which provides a fundamental understanding of the design, operation and practical applications of fiber optic sensing systems. The contributors describe the physical principles of fiber sensors and discuss the latest developments in optical fiber sensor field, including examples of the technologies in use. —*Lisa Tongning Li*

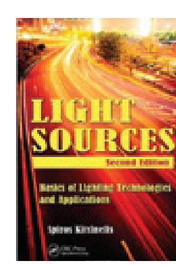
Optics Essentials: An Interdisciplinary Guide



A. Yacoubian; CRC Press, 2014

Optical technology is essential in many applications in medicine, communication and imaging. This book provides a basic overview of optical principles, concepts and applications, as well as worked examples throughout the text. The author enables readers to gain a basic understanding of optics without having to commit to an in-depth study. This book is for the non-specialist. —*A. Zakery*

Light Sources, 2nd ed.



Spiros and Spyridon Kitsinelis; CRC Press, 2015

This is not a scientific text. Rather, it covers modern lighting technology in an organized and comprehensive fashion for anyone, including lighting engineers and home or business owners wishing to know more about lighting. I have never before seen a book with so many photographs, diagrams and data summary tables—they are all helpful. A look at this book will benefit anyone interested in lighting. —*Albert C. Claus*

Christian Brosseau, OSA Fellow, Université de Bretagne Occidentale, France. Albert C. Claus, Loyola University, USA. Vengu Lakshminarayanan, University of Waterloo, Canada. Lisa Tongning Li, Inphenix, Inc, USA. Barry R. Masters, Fellow of AAAS, OSA and SPIE. K. Alan Shore, Bangor University School of Electronic Engineering, Wales, United Kingdom. A. Zakery, Shiraz University, Iran.

Patricia Daukantas and Valerie C. Coffey are freelance science writers who specialize in optics and photonics. Sarah Michaud is OPN's associate editor, and Stewart Wills is OPN's editor and content director.