Volume 2, Issue 16 ■ 20APR2012

S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

Feature Articles

Carbon nanotube nanosponges show promise for environmental cleanup, among many uses

Nanowerk, 16APR2012

A sponge made of pure carbon nanotubes with a dash of boron shows remarkable ability to absorb oil spills from the surface of water, according to researchers at Rice University and Penn State University. The oil can be stored in the sponge for later retrieval or burned off so the sponge can be reused. TECHNICAL ARTICLE

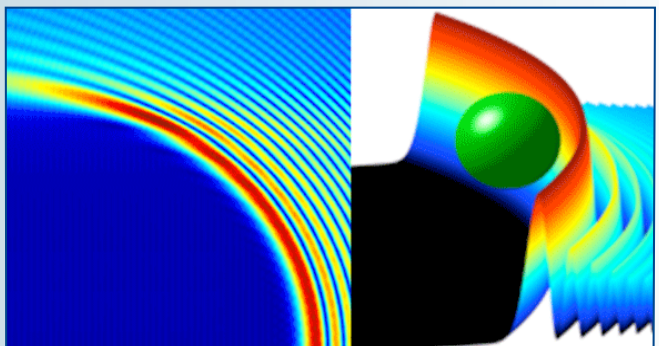
Tags: Advanced materials, Featured Article

Light Bends Itself into an Arc: Viewpoint

American Physical Society, 16APR2012

Apart from the broadening effects of diffraction, light beams tend to propagate along a straight path. Mirrors, lenses, and light guides are all ways to force light to take a more circuitous path, but an alternative that many researchers are exploring is to prepare light beams that can bend themselves along a curved path, even in vacuum. Mathematical solutions to Maxwell's equations suggest that it is possible for shape-preserving optical beams to bend along a circular path.

Tags: Breakthrough technology, Featured Article



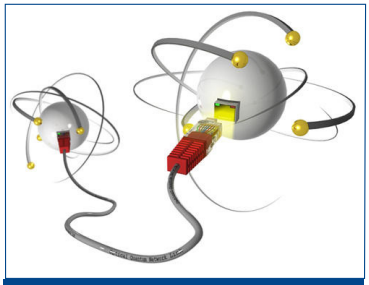
Kaminer et al. showed that shape-preserving beams of light that travel along a circular trajectory emerge as solutions to Maxwell's equations. (Left) Calculated propagation of a self-bending beam. This solution assumes the wave's electric field is polarized in the transverse direction (TE polarization). (Right) Illustration of a nondiffracting beam bending around an obstacle. (Left) Ref. [1]. (Right) Courtesy D. N. Christodoulides

Breakthrough in Quantum Communication

Science Daily, 11APR2012

A major breakthrough in this field has now been achieved by scientists at the Max Planck Institute of Quantum Optics. The physicists have set up the first, elementary quantum network. It consists of two coupled single-atom nodes that communicate quantum information via the coherent exchange of single photons. This approach to quantum networking is particularly promising because it provides a clear perspective for scalability.

Tags: Breakthrough technology, Communications Technology, Quantum science, Featured Article



Single atoms form the nodes of an elementary quantum network in which quantum information is transmitted via the controlled exchange of single photons. Credit: Andreas Neuzner, MPQ

S&T News Articles

ADVANCED MANUFACTURING

Homegrown labware made with 3D printer

KurzweilAI, 17APR2012

University of Glasgow chemist envisions that in the distant future, researchers and perhaps even ordinary consumers could download 3D printing programs similar to smartphone applications. Such applications might instruct the printer to create a vessel that has a pre-programmed and fully tested chemical reaction built in. The results could open the door to a new generation of custom labware (which they call "reactionware") made to suit individual researchers' needs. VIDEO

Tags: Advanced manufacturing, S&T UK

continued...

BACK TO TOP

Hot new manufacturing tool: A temperature-controlled microbe

PhysOrg.com, 17APR2012

Many manufacturing processes rely on microorganisms to perform tricky chemical transformations or make substances from simple starting materials. Researchers have found a way to control a heat-loving microbe with a temperature switch: it makes a product at low temperatures but not at high temperatures. The innovation could make it easier to use microorganisms as miniature factories for the production of needed materials like biofuels.

Tags: Advanced manufacturing, Energy

3D-Printer with Nano-Precision (w/ video)

Vienna University of Technology, 13APR2012

Printing three dimensional objects with incredibly fine details is now possible using "two-photon lithography." With this technology, tiny structures on a nanometer scale can be fabricated. Researchers at the Vienna University of Technology (TU Vienna) have now made a major breakthrough in speeding up this printing technique.

Tags: Advanced manufacturing

ADVANCED MATERIALS

Electron microscopy inspires flexoelectric theory behind 'material on the brink'

Science Daily, 16APR2012

A research team at ORNL (Oak Ridge National Laboratory) examined thin films of bismuth samarium ferrite, known as BSFO, which exhibits unusual physical properties near its transition from one phase to another. BSFO holds potential as a lead-free substitute for lead zirconium titanate (PZT), a similar material currently used in dozens of technologies from sensors to ultrasound machines.

Tags: Advanced materials, Materials science

Stimulated Near-Infrared Light Emission in Graphene: Viewpoint

American Physical Society, 16APR2012

Graphene's unique mechanical, transport, chemical, and linear optical properties are fairly well established. The effects of exciting graphene with femtosecond pulses of light that create nonequilibrium charge states haven't been well studied. Ames Laboratory and Iowa State University researchers show that a pronounced population inversion can be created in graphene and can lead to optical gain in the infrared spectrum which makes it possible to explore optical applications of graphene in laser technology and telecommunications that might surpass the present performance of semiconductor quantum wells.

Tags: Advanced materials

AUTONOMOUS SYSTEMS & ROBOTICS

Unmanned vessel could soon be working for Navy

R&D Magazine, 13APR2012

The boat is 39 feet long and can reach a top speed of 28 knots. Using a modified version of the unmanned Shadow surveillance aircraft technology that logged 700,000 hours of duty in the Middle East, the boat can be controlled remotely from 10 to 12 miles away from a command station on land, at sea or in the air.

Tags: Autonomous systems & robotics

COMMUNICATIONS TECHNOLOGY

'Sounds of silence' proving a hit: World's fastest random number generator

Science Daily, 16APR2012

Scientists in Australia have discovered that vacuum is an extent of space that has virtual sub-atomic particles spontaneously appearing and disappearing. It is the presence of these virtual particles that give rise to random noise. This 'vacuum noise' is omnipresent and may affect and ultimately pose a limit to the performances of fibre optic communication, radio broadcasts and computer operation.

Tags: Communications Technology, Information technology

First message transmitted via neutrinos

R&D Magazine, 11APR2012

Scientists have for decades contemplated communicating via neutrinos when other methods won't do. For the first time, physicists and engineers at Fermi National Accelerator Laboratory's MINERvA detector have successfully transmitted a message through 240 m of rock using these ghost-like particles.

Tags: Communications Technology, Breakthrough technology

CYBER SECURITY

US and China engage in cyber war games

The Guardian, 16APR2012

State Department and Pentagon officials, along with their Chinese counterparts, were involved in two war games last year that were designed to help prevent a sudden military escalation between the sides if either felt they were being targeted. Another session is planned for May. The war games have been organised through the CSIS (Center for Strategic and International Studies) and a Beijing think tank, the China Institute of Contemporary International Relations.

Tags: Cyber security

continued...

"Everything should be made as simple as possible, but not simpler."

ALBERT EINSTEIN

ENERGY

Carbon nanotube electrodes improve solar cells

Nanowerk, 17APR2012

The single-wall nanotube arrays, grown in a process invented at Rice University, are both much more electro-active and potentially cheaper than platinum, a common catalyst in DSCs. In combination with newly developed sulfide electrolytes synthesized at Tsinghua Univeris-sty (China), they could lead to more efficient and robust solar cells at a fraction of the current cost for traditional silicon-based solar cells.

Tags: Energy, Solar energy

Artificial photosynthesis breakthrough: Fast molecular catalyzer

Science Daily, 13APR2012

Scientists in Sweden have constructed a molecular catalyzer that can oxidize water to oxygen very rapidly. The speed with which natural photosynthesis occurs is about 100 to 400 turnovers per seconds. Scientists have now reached over 300 turnovers per seconds with their artificial photosynthesis. The research findings play a critical role for the future use of solar energy and other renewable energy sources.

Tags: Energy, Renewable energy, S&T Sweden

Nontoxic nanosheets could turn waste heat into power

R&D Magazine, 13APR2012

Cornell materials scientists have developed an inexpensive, environmentally friendly way of synthesizing oxide crystal sheets, just nanometers thick, which have useful properties for electronics and alternative energy applications. Unlike typical oxides, these sheets are conducting, and could be ideal for use in thermoelectric devices to convert waste heat into power.

Tags: Energy, Advanced materials

GOVERNMENT S&T

US non-lethal weapon 'wish list' revealed on the net

BBC News, 04APR2012

An alleged US military wish list of real and conceptual non-lethal weapons has been published online. The document includes improvements to equipment already in use as well as proposals for new technologies. The list includes lasers and heat beams designed to disperse crowds, and nausea-inducing sound waves targeted at scuba divers. A copy of the report was obtained and published by "anti-secrecy" site Public Intelligence. (U) Joint Non-Lethal Weapons Directorate (JNLWD)

Tags: Government S&T, Military technology

INFORMATION TECHNOLOGY

Mavericks invent future Internet where Cisco is meaningless

KurzweilAI, 17APR2012

Silicon Valley startup Nicira wants to make Cisco irrelevant, taking the brains out of network hardware and moving them into software, to provide a far easier way of building and modifying and rebuilding the networks that run the largest services on the web and beyond, using "software-defined networking" (SDN). The Nicira platform is already used by AT&T, eBay, Japanese telecom NTT, financial giant Fidelity, and Rackspace.

Tags: Information Technology, Communications Technology

A Startup Puts the Internet in Your Couch Cushions

MIT Technology Review, 16APR2012

Sensor-filled Ninja Blocks connect the Web with whatever's nearby. Ninja Blocks are aimed at popularizing an idea known as "the Internet of things"—the connection of everyday objects to the Internet. The blocks make it easier for the average person to control technology without actually knowing how to program. A basic Ninja Block includes a Linux board, a customized Arduino, a built-in temperature sensor, an accelerometer, and a multicolor LED that gives notifications.

Tags: Information Technology

Training computers to recognise emotion (w/video)

BBC News, 16APR2012

MIT researchers are working on computers that can read facial expressions and track basic states like confusion, liking or disliking. Wearable devices, such as electronic bracelets, can detect stress or excitement by measuring minimal changes in the sweat level. Emotion measurement technology will be soon ubiquitous. It will allow people to communicate in new different ways. It's a kind of very sophisticated version of the 'Like' button on Facebook.

Tags: Information Technology, Sensors

Computer Scientists Build Computer Using Swarms of Crabs

MIT Technology Review, 12APR2012

Researchers from Kobe University in Japan have built what is essentially a billiard ball computer using soldier crabs. This is motivated by two lines of thought: ordinary comput-

continued...

ers are hugely energy inefficient and nature has evolved many much more efficient forms of computation for specific tasks such as pattern recognition.
Tags: Information Technology, Biomimetics, S&T Japan

Memory stick that self-destructs: VIDEO
BBC News, 12APR2012
Technology has now created the ultimate USB stick—used by the secret service. If you lose it you can track its location and even remotely scramble content on it if you are worried it could fall into the wrong hands.
Tags: Information Technology

Featured Resource

Science Newsline
Sciencenewsline.com is an experimental site to evaluate smart web application technologies, such as machine learning, data clustering, semantic analysis, etc. Software algorithms classify articles by categories, then select appropriate related stories for each. News feeds

MATERIALS SCIENCE

Magnetic fields can send particles to infinity
Science Daily, 17APR2012
Researchers have mathematically shown that particles charged in a magnetic field can escape into infinity without ever stopping. One of the conditions is that the field is generated by current loops situated on the same plane. At the moment this is a theoretical mathematical study, but researchers have recently demonstrated that, in certain conditions, magnetic fields can send particles to infinity.
Tags: Materials science

Novel chemical reaction
PhysOrg.com, 16APR2012
Scientists at the University of Delaware have developed a chemical reaction that converts carbon-hydrogen bonds to carbon-silicon bonds using the metal palladium as a catalyst, yielding an important new tool for building molecules. The potential industrial applications are broad, ranging from the manufacture of medicines to plastics.
Tags: Materials science

Detecting material defects in ship propellers
EurekAlert, 13APR2012
Propellers can weigh up to 150 tons, and measure nine meters or more in diameter. Until now, propellers have been inspected manually for inner defects when necessary. Researchers in Germany have developed a mechanized ultrasound process that can be used for the non-destructive testing of complex components. The mobile ultrasound test system can inspect copper-nickel-aluminum bronzes up to 450 millimeters thick and detect fissures down to a few millimeters in length.
Tags: Materials science, Military technology

Researcher takes aim at never-before-seen state of matter
R&D Magazine, 12APR2012
Researchers at the University of New Hampshire are building a piece of equipment to find a predicted, but never-before-seen state of matter called true muonium. It is a rare atom made from two muon particles, which are similar to electrons.
Tags: Materials science, Advanced materials

Rare Earth Elements in National Defense: Background, Oversight Issues, and Options for Congress
Congressional Research Service, 11APR2012
Congress may encourage DOD to develop a collaborative, long-term, well-thought-out strategy designed to identify any material weaknesses and vulnerabilities associated with rare earths and to protect long-term U.S. national security interests.
Tags: Materials science, S&T Policy

MICROELECTRONICS

New carbon-based material derived from graphene advances nanoelectronics
Nanowerk, 16APR2012
Researchers at the University of Wisconsin-Milwaukee (UWM) have discovered an entirely new carbon-based material that is synthesized from graphene. The discovery called graphene monoxide (GMO) exhibits all three characteristics of electrical conductivity—conducting, insulating and semiconducting—offering needed compatibility for use in future electronics.
Tags: Microelectronics, Nanoelectronics

Simulating tomorrow's chips
MIT News, 13APR2012
Unlike competing methods, the new design guarantees that the simulator won't go into "deadlock"—a state in which cores get stuck waiting for each other to relinquish system resources, such as memory. The method should also make it easier for designers to develop simulations and for outside observers to understand what those simulations are intended to do.
Tags: Microelectronics, Information technology

New frontier: Chips transfer data at light speed
Nanowerk, 12APR2012
The computer industry is nearing a crisis: microchips get smaller and faster but they struggle to transfer data at sufficient speeds. Electrons flowing through standard chip

continued...

connections are just too slow. Now EU-funded researchers have shown how chips with built-in lasers which use multiple wavelengths of light could in the future transmit data at terabit speeds.
Tags: Microelectronics, S&T EU

NEUROSCIENCE

Pretty pictures: Can images stop data overload?
BBC News, 16APR2012
In a lab in Sussex a group of people have had their brainwaves scanned while completing a series of tasks, individually and in groups, to see if data visualisation can help. The results showed that when tasks were presented visually rather than using traditional text-based software applications, individuals used around 20% less cognitive resources, their brains were working a lot less hard. As a result, they performed more efficiently, and could remember more of the information when asked later. Working in groups, they used 10% less mental resources.
Tags: Neuroscience

The eye limits the brain's learning potential
Nature Scientific Reports, 16APR2012
The concept of a critical period for visual development early in life during which sensory experience is essential to normal neural development is now well established. However recent evidence suggests that a limited degree of plasticity remains after this period and well into adulthood. Although this limit has been assumed to be due to neural factors, new research shows that the optical quality of the retinal image ultimately limits the brain potential for change.
Tags: Neuroscience

Data mining opens the door to predictive neuroscience
EurekAlert, 11APR2012
The discovery, using state-of-the-art informatics tools, increases the likelihood that it will be possible to predict much of the fundamental structure and function of the brain without having to measure every aspect of it. That in turn makes the Holy Grail of modeling the brain in silico—the goal of the proposed Human Brain Project.
Tags: Neuroscience, S&T France

Distinct Brain Cells Recognize Novel Sights
Science Newsline, 11APR2012
No matter what novel objects we come to behold, our brains effortlessly take us from an initial "What's that?" to "Oh, that old thing" after a few casual encounters. In research that helps shed light on the malleability of this recognition process, Brown University neuroscientists have teased apart the potentially different roles that two distinct cell types may play.
Tags: Neuroscience

QUANTUM SCIENCE

Photon Pairs Get More Commercial
American Physical Society, 13APR2012
Quantum cryptography, quantum computing, and other futuristic technologies require pairs of photons that are entangled, meaning they share a quantum state. Now researchers have taken a step toward making those pairs as part of an integrated circuit for photons that could ultimately include tiny lasers and optical "wires."
Tags: Quantum science, Photonics

S&T POLICY

Bill would allow federally funded centers to get exclusive access to government work
Federal Computer Week, 13APR2012
Defense Department officials want to give Federally Funded Research and Development Centers access to government research and development work for up to five years, bypassing market competition, according to a new defense bill. H.R. 4310: National Defense Authorization Act for Fiscal Year 2013 (See Section 802).
Tags: S&T policy, R&D funding

SCIENCE WITHOUT BORDERS

Australia-New Zealand Square Kilometre Array site is already producing world-class astrophysics
EurekAlert, 16APR2012
The research uses the Murchison Widefield Array (MWA), a $50m SKA Precursor telescope located at the MRO. The MWA project is led by the International Centre for Radio Astronomy Research at Curtin University. The MWA is being delivered by an international consortium of thirteen institutions in four countries: Australia; the USA; India; and New Zealand.
Tags: Science without borders, Astronomy

Engineers put 5-story building on seismic shake table to test for earthquake and fire readiness
EurekAlert, 13APR2012
Structural engineers at the University of California, San Diego are about to find out during a two-week series of tests conducted on the world's largest outdoor shake table at the Englekirk Structural Engineering Center. The overarching goal of the $5 million project is to ascertain what needs to be done to make sure that high-value buildings, such as hospitals and data centers, remain operational after going through an earthquake.
Tags: Science without borders

Protesters sprayed with 'smelly water': VIDEO
BBC News, 11APR2012
The Israeli army is using a non-lethal method of dispersing Palestinian protesters in the occupied territories—spraying

continued...

them with an overpoweringly smelly fluid known as 'skunk water', a chemical fluid with a overpowering stench that clings to the body for weeks.

Tags: Science without borders, Foreign S&T, Military technology

SENSORS

Electrical engineers develop LED 'Magic Wands'

PhysOrg.com, 17APR2012

Engineers from the University of Bristol (UK) made three LED Wands that work by allowing radio frequency signal levels from Wi-Fi, cellular or FM radio to be sent to the Wand using Bluetooth. This information is then visualised using a microcontroller which illuminates a two-metre strip of LED lights. If you put a camera on a long exposure and then walk around with the wand you get to see a bright graph of the radio signals in your local environment.

Tags: Sensors, Information technology

Innovative glove-within-a-mitten lets users stay 'touchscreen friendly' in cold winter

Science Daily, 16APR2012

Hand-held touch screen devices such as smart phones and tablet computers rely on faint electrical signals from our fingers. ISGLOVESTM allow the wearer to operate touch screen devices, as they are made of special conductive materials. Special polyester yarns treated at dimensions between 1 to 100 nanometres, were interwoven with bamboo yarns to give ISGLOVESTM its unique conductive and touch sensitive functionalities.

Tags: Sensors, Information technology

New Sensor Sought to Enable Military Missions in GPS-denied Areas

DARPA, 16APR2012

DARPA's Chip-Scale Combinatorial Atomic Navigator (C-SCAN) effort seeks an atomic inertial sensor to measure orientation in GPS-denied environments. Such a sensor would integrate small size, low power consumption, high resolution of motion detection and a fast start up time into a single package. SOLICITATION

Tags: Sensors, DARPA, Government S&T ■

About This Publication

The appearance of external hyperlinks in this publication does not constitute endorsement by the United States Department of Defense (DoD) of the linked web sites, nor the information, products or services contained therein. In addition, the content featured does not necessarily reflect DoD's views or priorities.

To subscribe (or unsubscribe), visit https://tin-ly.sainc.com/ASDRE. To provide feedback or ask questions, contact us at asdre-st-bulletin-reply@sainc.com.

This publication is authored and distributed by:

Dr. Melissa Flagg
Director, Office of Technical Intelligence (OTI)

Ms. Hema Viswanath
OTI Corporate Librarian