Volume 3, Issue 2 ■ 11JAN2013

S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

FEATURE ARTICLES

Counting the twists in a helical light beam

Harvard University, 08JAN2013

Researchers at Harvard University have designed a device that enables a conventional optical detector (which would normally only measure the light's intensity) to pick up on the rotation of optical vortex, or vortex beam, which is a complex beam with waves that rotate as they travel. The new device has the potential to add capacity to future optical communication networks. TECHNICAL ARTICLE

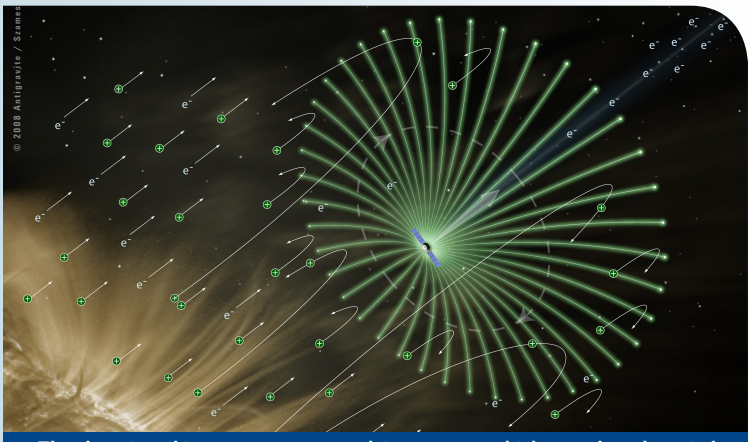
Tags: Communications Technology, Featured Article

Space sailing soon: A one-kilometer-long electric sail tether produced

Science Daily, 08JAN2013

An electric sail (ESAIL) produces propulsion power for a spacecraft by utilizing the solar wind. The sail features electrically charged long and thin metal tethers that interact with the solar wind. Using ultrasonic welding,engineers in Finland successfully produced a 1 km long ESAIL tether. MORE INFORMATION

Tags: Energy, Space technology, Featured Article



The electric sail is a new space propulsion concept which uses the solar wind momentum for producing thrust (Janhunen, P., Electric sail for spacecraft propulsion, AIAA Journal of Propulsion and Power, 20, 4, 763-764, 2004, Janhunen, P. and A. Sandroos, Simulation study of solar wind push on a charged wire: solar wind electric sail propulsion, Ann. Geophys., 25, 755-767, 2007). The electric sail is somewhat similar to the more well-known solar radiation pressure sail which is often called simply the solar sail.

Heat flows 'backwards' across Josephson junction

Physics World, 07JAN2013

The experiment was done by two physicists in Italy and confirms a theoretical prediction made in 1965. As well as confirming the bizarre prediction that some heat flows from the cold side of the junction to the hot side, the breakthrough could further the development of thermal circuits that use heat in much the same way as charge is used in electronic devices.

Tags: Breakthrough technology, Materials science, S&T Italy, Featured Article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

Breaking the Mold: Could Additive Manufacturing Resuscitate a Once-Proud U.S. Industry?

Scientific American, 07JAN2013

Whereas traditional assembly-line work may never return stateside in a big way, manufacturers and government agencies have begun placing bets on additive manufacturing technologies—including 3-D printing—that they believe could represent the industry's future.

Tags: Advanced manufacturing

ADVANCED MATERIALS

Study reveals ordinary glass's extraordinary properties

EurekAlert, 06JAN2013

Researchers at the universities of Chicago and Wisconsin-Madison raise the possibility of designing ultrastable glasses at the molecular level via a vapor-deposition process. Ultrastable glasses could find potential applications in the production of stronger metals and faster-acting pharmaceuticals.

Tags: Advanced materials, Materials science

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BACK TO TOP

New 2D material for next generation high-speed electronics

Nanowerk, 04JAN2013

An international team of researchers created nanoscale transistors using layered sheets of molybdenum oxide. Within these layers, electrons are able to zip through at high speeds with minimal scattering. TECHNICAL ARTICLE

Tags: Advanced materials, Breakthrough technology

AUTONOMOUS SYSTEMS & ROBOTICS

Researchers develop acrobatic space rovers to explore moons and asteroids

Science Daily, 08JAN2013

The platform proposed by researchers at Stanford University involves a mother spacecraft deploying one or several spiked, roughly spherical rovers to the Martian moon Phobos. Measuring about half a meter wide, each rover would hop, tumble and bound across the cratered, lopsided moon, relaying information about its origins, as well as its soil and other surface materials.

Tags: Autonomous systems & robotics, Space technology

Video Friday: Chasing Police with Drones, Competitive Robot Foraging, and NAO Keeps a Beat

IEEE Spectrum, 04JAN2013

The DARPA ACTUV program aims to develop an unmanned autonomous surface vessel with the ability to track a quiet diesel-electric submarine overtly for months over thousands of kilometers, with minimal human input.

Tags: Autonomous systems & robotics

BIG DATA

Mobility and Big Data: Why They Need Each Other to Thrive

Xconomy, 07JAN2013

The dramatic growth, coupled with low-cost, large-scale data architectures, is making it possible for "Big Data" to capture, analyze, and act in real-time to maximize the impact for business. The author argues that big data and mobile are also intertwined, and the total societal impact of one depends on the other.

Tags: Big data

BIOTECHNOLOGY

Adaptable prosthetics for amputees being developed in the UK

Science Daily, 08JAN2013

Researchers in the UK are creating a 'smart socket'—a lower-limb prosthetic which can adjust itself to fit the changing shape of the limb stump it connects with. The design team says the fit will be so comfortable that amputee servicemen may even be able to return to active combat.

Tags: Biotechnology, S&T UK

The living lab: Navigating into cells

Science Daily, 07JAN2013

The Living Lab is an innovative partnership between NIH and FEI, an Oregon-based instrumentation company that manufactures advanced microscopes. Using cutting edge technology, scientists in the Living Lab, unencumbered by any pressure to patent or otherwise protect discoveries for commercial purposes, can proceed purely driven by scientific and biomedical puzzles.

Tags: Biotechnology, Biology

BREAKTHROUGH TECHNOLOGY

Physicists Demonstrate First Laser Made From a Cloud of Gas

MIT Technology Review, 07JAN2013

It turns out that in certain circumstances the very atmospheres of stars and planets can lase. Researchers in France built their laser out of a small cloud of rubidium atoms confined in a magneto-optical trap. They excite the atoms and then zap them with a laser tuned close to the expected emission frequency of rubidium. This bounces around at random inside the cloud triggering the stimulated emission of light. TECHNICAL ARTICLE

Tags: Breakthrough technology

COMMUNICATIONS TECHNOLOGY

The Spectrum Crunch That Wasn't

MIT Technology Review, 05JAN2013

Cisco Systems estimates that mobile data traffic will grow by a factor of 18 by 2016, and Bell Labs predicts it will increase by a factor of 25. So can new technology stave off a spectrum shortage forever? Perhaps not, but Microsoft's Tennenhouse says that decades of research advances are waiting to be applied to the problem: Right now, we have a 15- to 20-year backlog of new technologies and architectures which can take us a long way into the future.

Tags: Communications Technology

COUNTER WMD

Canadian team develops ricin antidote

Bioprewatch, 02JAN2013

The team from Defense Research and Development Canada created four ricin-resistant hybridoma clones that secrete antiricin monoclonal antibodies with ricin-neutralizing capabilities. Their effectiveness was determined through an in vitro neutralization assay that showed success in mice subjects against multiple ricin challenges.

Tags: Counter WMD

continued...

"That which can be asserted without evidence, can be dismissed without evidence."

CHRISTOPHER HITCHENS

ENERGY

Scientists mimic fireflies to make brighter LEDs: New bio-inspired coating that increases LED efficiency by 55 percent

Science Daily, 08JAN2013

Researchers in Belgium, France and Canada studied the internal structure of firefly lanterns, the organs on the bioluminescent insects' abdomens. The scientists identified an unexpected pattern of jagged scales that enhanced the lanterns' glow, and applied that knowledge to LED design. The overlayer increased LED light extraction by up to 55 percent. TECHNICAL ARTICLE

Tags: Energy, Biomimetics

Featured Resource

Perry-Castañeda Library Map Collection (UT Austin)

Includes collection of online CIA and historical maps, worldwide coverage, extensive directory of links to other sites.

Engineered bacteria make fuel from sunlight

Science Daily, 07JAN2013

Researchers at UC Davis identified enzymes that carried out the reactions they were looking for, and then introduced the DNA for these enzymes into the cyanobacteria. Working a step at a time, they built up a three-step pathway that allows the cyanobacteria to convert carbon dioxide into 2,3 butanediol, a chemical that can be used to make paint, solvents, plastics and fuels. TECHNICAL ARTICLE

Tags: Energy

A pathway for protons: Efficient delivery to material's center turns oxygen cleanly into water

PhysOrg.com, 06JAN2013

Researchers in the US have built two iron-based compounds that help protons move from the exterior to where they are needed. In previous compounds, the protons often don't arrive in time or go to the wrong place, which leads to forming the unwanted byproduct hydrogen peroxide (H2O2). The new compounds direct the protons in ways that help separate the two oxygen atoms in O2, and thereby drives the reaction to completion. TECHNICAL ARTICLE

Tags: Energy

GOVERNMENT S&T

Germany successfully tests a 50kW high-energy laser weapon

Next Big Future, 07JAN2013

Conducted at the end of November 2012, the test encompassed the entire operational sequence from target detection and tracking to target engagement. They shot down flying USV drones from a distance of 2000 meters and cut through a little over one half inch of steel from 1000 meters and had a successful test interception of a mortar.

Tags: Government S&T, Military technology, S&T Germany

Lockheed Martin Demonstrates High-Energy Laser C-RAM Application

Defense Update, 07JAN2013

The Lockheed Martin Area Defense Anti-munitions (ADAM) prototype laser weapon system successfully destroyed a rocket target from a range of 1.6 kilometers. The complete engagement—from target acquisition, tracking to illumination and destruction took approximately three seconds.

Tags: Government S&T, Military technology

How computers push on the molecules they simulate

Nanowerk, 04JAN2013

Dynamic computer simulations of molecular systems depend on finite time steps, but these introduce apparent extra work that pushes the molecules around. Using models of water molecules in a box, researchers at the Berkeley Laboratory have learned to separate this shadow work from the protocol work explicitly modeled in the simulations. TECHNICAL ARTICLE

Tags: Government S&T, Simulation and modeling

INFORMATION TECHNOLOGY

Even brief interruptions spawn errors

Science Daily, 08JAN2013

Short interruptions—such as the few seconds it takes to silence that buzzing smartphone—have a surprisingly large effect on one's ability to accurately complete a task, according to Michigan University research.

Tags: Information Technology

continued...

MATERIALS SCIENCE

Bottom-up approach provides first characterization of pyroelectric nanomaterials

Science Daily, 08JAN2013

By moving to a 'bottom-up' approach that produces nanoscale versions of ferroelectric materials as thin films, researchers at the University of Illinois have observed, for the first time, that certain features, namely domain walls, can be incredibly important and even dominate the temperature-dependent response and performance of these materials. The finding has implications for technologies such as infrared sensors, night-vision, and energy conversion units.

Tags: Materials science

Graphene oxide soaks up radioactive waste from groundwater

Nanowerk, 08JAN2013

A collaborative effort by the US and Russian researchers determined that microscopic, atom-thick flakes of graphene oxide bind quickly to natural and human-made radionuclides and condense them into solids. It could cut the cost of hydraulic fracturing ("fracking") for oil and gas recovery and help reboot American mining of rare earth metals. TECHNICAL ARTICLE

Tags: Materials science

New antimatter method to provide 'a major experimental advantage'

PhysOrg.com, 07JAN2013

Researchers the US and Canada have proposed a method for cooling trapped antihydrogen which they believe could provide 'a major experimental advantage' and help to map the mysterious properties of antimatter that have, to date, remained elusive. TECHNICAL ARTICLE

Tags: Materials science

Researchers Show New Level of Control Over Liquid Crystals

Science Daily, 07JAN2013

An interdisciplinary team of researchers from the University of Pennsylvania has shown a new way to direct the assembly of liquid crystals, generating small features that spontaneously arrange in arrays based on much larger templates. TECHNICAL ARTICLE

Tags: Materials science

Metal-Coated Waveguide Stretches Wavelengths to Infinity

American Physical Society Spotlight, 06JAN2013

A zero refractive index at optical frequencies, as demonstrated in a new nanoscale waveguide, enables opportunities for better control and enhancement of light propagation in waveguides, as well as development of photonic nanocircuits. TECHNICAL ARTICLE

Tags: Materials science

Power spintronics: Producing AC voltages by manipulating magnetic fields

Science Daily, 05JAN2013

Scientists are putting a new spin on their approach to generating electrical current by harnessing a recently identified electromotive force known as spinmotive force that addresses such challenges as improving data storage in computers. Now, a novel application of spintronics is the highly efficient and direct conversion of magnetic energy to electric voltage by using magnetic nanostructures and manipulating the dynamics of magnetization. TECHNICAL ARTICLE

Tags: Materials science

MICROELECTRONICS

New design for basic component of computer chips: Researchers demonstrate record-setting p-type transistor

Science Daily, 05JAN2013

Almost all computer chips use p- and n-type transistors. Improving the performance of the chip as a whole requires parallel improvements in both types. Researchers at MIT have presented a p-type transistor with the highest "carrier mobility" yet measured. By that standard, the device is twice as fast as previous experimental p-type transistors and almost four times as fast as the best commercial p-type transistors.

Tags: Microelectronics

QUANTUM SCIENCE

Unlocking nature's quantum engineering for efficient solar energy

PhysOrg.com, 07JAN2013

Certain biological systems living in low light environments have unique protein structures for photosynthesis that use quantum dynamics to convert 100% of absorbed light into electrical charge, displaying astonishing efficiency that could lead to a new understanding of renewable solar energy. TECHNICAL ARTICLE

Tags: Quantum science, Energy

New phase in reading photons

Science Daily, 06JAN2013

A new photodetector can cleanly discriminate among four states, not just the standard two states of binary logic. Success has come by viewing light pulses not with a single passive detector, but an adaptive network of detectors with feedback. By combining many such stages and using information gained by previous stages to adjust the phase of the reference wave in successive stages, a better estimate of the signal phase can be obtained. TECHNICAL ARTICLE

Tags: Quantum science, Communications Technology

continued...

Quantum Gas Temperature Drops Below Absolute Zero

Wired UK, 04JAN2013

Physicists have created a quantum gas capable of reaching temperatures below absolute zero, paving the way for future quantum inventions.

Tags: Quantum science

S&T POLICY

China gives biotech industry a boost

China NOST News, 07JAN2013

The government plans to improve the sector's innovation and technological prowess to make it a pillar industry by 2020. The government is targeting an annual production value of 150 billion yuan (23.8 billion U.S. dollars) by 2015 for the biofuel sector, according to the plan.

MORE INFORMATION

Tags: S&T policy, S&T China

SCIENCE WITHOUT BORDERS

Employment and Educational Characteristics of Scientists and Engineers

NSF News, 07JAN2013

Nearly 22 million persons classified as scientists and engineers were employed in the United States as of October 2010: about 5.4 million in science and engineering (S&E) occupations, 7 million in S&E-related occupations, and 9.5 million in occupations other than S&E. These estimates are from the National Science Foundation's Scientists and Engineers Statistical Data System (SESTAT).

Tags: Science without borders

France sets requirements for nanoparticles

PhysOrg.com, 06JAN2013

France has become the first country in Europe to require manufacturers to identify use of nano-particles, that are increasingly found in drugs and consumer products. Some research, including a study carried out on chickens in February last year, has suggested that the particles may be harmful for the gut, where they interact with intestinal processes.

Tags: Science without borders, S&T France

Science Communication: A Practical Guide for Scientists

Alpha Galileo Foundation, 06JAN2013

Science Communication is a unique guide to help the novice scientist get started with science communication. The informal 'recipe' style layout applied to an academic text book gives hints, tips and warns of potential pitfalls about how to begin to undertake face-to-face science communication and engagement activities with the public.

Tags: Science without borders

SENSORS

Draw Your Own Sensor

MIT Technology Review, 05JAN2013

A new fabrication method created by MIT chemists—one as simple as drawing a line on a sheet of paper—may lead to a powerful new way to detect harmful gases in the environment. Gas-detecting sensors can be inscribed on any paper surface with a pencil in which a compressed powder of carbon nanotubes serves as the lead.

Tags: Sensors ■

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