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S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

FEATURE ARTICLES

Breakthrough brings optical data transport closer to replacing wires

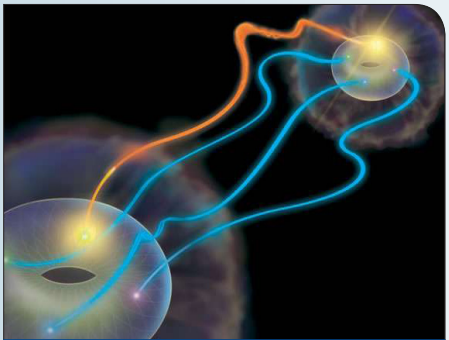
PhysOrg.com, 28MAY2015

In computers, up to 80 percent of the microprocessor power is consumed by sending data over the wires. As silicon is transparent to infrared light, wires could be replaced by optical interconnects: silicon structures designed to carry infrared light. Researchers at Stanford University invented an inverse design algorithm where they specify what they want the optical circuit to do, and the software provides the details of how to fabricate a silicon structure to perform the task which greatly speeds up interconnect design. TECHNICAL ARTICLE

Tags: Microelectronics, Information technology, Featured Article

Donuts, math, and superdense teleportation of quantum information

PhysOrg.com, 28MAY2015



In superdense teleportation of quantum information, Alice (near) selects a particular set of states to send to Bob (far), using the hyperentangled pair of photons they share. Credit: Precision Graphics, copyright Paul Kwiat, University of Illinois at Urbana-Champaign

By taking advantage of the mathematical properties intrinsic to torus, a team of researchers in the US (University of Illinois at Urbana-Champaign, Hampshire College, State University of New York at Stony Brook) has made great strides by realizing "superdense teleportation." With this new protocol, the researchers have experimentally achieved 88 percent transmission fidelity, twice the classical upper limit of 44 percent. The protocol uses pairs of photons that are "hyperentangled" with a restricted number of possible states in each variable. TECHNICAL ARTICLE

Tags: Quantum science, Featured Article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

Boosting confidence in new manufacturing technologies

PhysOrg.com, 01JUN2015

Despite its revolutionary promise, additive manufacturing is still in its infancy when it comes to understanding the impact of subtle differences in manufacturing methods on the properties and capabilities of resulting materials. DARPA's Open Manufacturing program seeks to solve this problem.

Tags: Advanced manufacturing

ADVANCED MATERIALS

Mission possible: This device will self-destruct when heated

PhysOrg.com, 21JUN2015

Researchers at the University of Illinois have developed heat-triggered self-destructing electronic devices which use magnesium circuits printed on very thin, flexible materials. They trap microscopic droplets of a weak acid in wax, and coat the devices with the wax. When the devices are heated, the wax melts, releasing the acid. The acid dissolves the device quickly and completely. They also developed a radio-controlled trigger that could remotely activate self-destruction on demand. TECHNICAL ARTICLE

Tags: Advanced materials, Materials science

An inexpensive rival to graphene aerogels

Science Daily, 02JUN2015

Graphene aerogels are gaining traction as more desirable alternatives to electromagnetic radiation shielding material. Using organic chemistry and conducting polymers, researchers in China have fabricated a three-dimensional polypyrrole aerogel-based electromagnetic absorber with properties similar to a graphene aerogel—in terms of its conductivity, as well as a lightweight, anticorrosive, porous structure. TECHNICAL ARTICLE

Tags: Advanced materials, S&T China

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Researchers synthesize magnetic nanoparticles that could offer alternative to rare Earth magnets

PhysOrg.com, 02JUN2015

The new material, synthesized by researchers at the Virginia Commonwealth University, consists of nanoparticles containing iron, cobalt and carbon atoms with a magnetic domain size of roughly 5 nanometers. It can store information up to 790 kelvins with thermal and time-stable, long-range magnetic order, which could have a potential impact for data storage application. TECHNICAL ARTICLE

Tags: Advanced materials

Etched holes increase speed of graphene electrodes

Nanotechweb, 01JUN2015

Researchers at the US Army Research Laboratory report that the speed of micro- or meso-porous graphene-based supercapacitor electrodes has been increased by over an order of magnitude. The increased electrode response frequency is due to a decrease in ionic impedance and is supported by the simulations performed. The benefit of the etched hole arrays is found to increase with electrode thickness. TECHNICAL ARTICLE

Tags: Advanced materials, Materials science

Nanowire-based design incorporates two semiconductors to enhance absorption of light

PhysOrg.com, 01JUN2015

A team of researchers in the US (Caltech, University of Southern California) demonstrated that it is possible to join Si and GaAs, two semiconductors that optimally absorb a different portion of the solar spectrum, to create two high energy species that can catalyze different chemical reactions. Such an arrangement may enable the development of a device that generates storable solar fuels by splitting water into hydrogen and oxygen using fused semiconductors. TECHNICAL ARTICLE

Tags: Advanced materials, Energy, Solar energy

New 'designer carbon' from Stanford boosts battery performance

Nanotechweb, 29MAY2015

Researchers at Stanford University used a mild carbonization and activation process to convert polymer organic frameworks into nanometer-thick sheets of carbon. The carbon sheets form a 3-D network that has good pore connectivity and high electronic conductivity. They added potassium hydroxide to chemically activate the carbon sheets and increase their surface area. Carbon can be fine-tuned for a variety of applications.

Tags: Advanced materials

AUTONOMOUS SYSTEMS & ROBOTICS

Helping robots handle uncertainty

MIT News, 02JUN2015

Decentralized partially observable Markov decision processes (Dec-POMDPs) are a way to model autonomous robots' behavior in circumstances where neither their communication with each other nor their judgments about the outside world are perfect. Researchers at MIT have created and tested a system that can generate the lower-level control systems from scratch, while still solving Dec-POMDP models in a reasonable amount of time.

Tags: Autonomous systems & robotics

Underwater robots aim to mimic nature

BBC News, 01JUN2015

The CoCoRo project is a collaboration among several European universities and aims to create an autonomous swarm of interacting autonomous underwater vehicles. The AUVs are programmed to mimic the collective traits of various animals and fish and it is hoped that the robots will work together much like the organisms do in real life.

Tags: Autonomous systems & robotics

Damage Recovery Algorithm Could Make All Robots Unstoppable

IEEE Spectrum, 27MAY2015

Using an exceptionally clever algorithm developed by an international team of researchers (France, USA), the hexapods have demonstrated that they can shrug off absurd amounts of damage, adapting within minutes to recover their mobility even if you chop a third of their legs off. Now the researchers report that their findings can be applied to a new form factor: a planar robotic arm. This illustrates how it's possible to endow just about any robot with resiliency via this algorithm, as long as it's got enough degrees of freedom to enable adaptive movement. TECHNICAL ARTICLE

Tags: Autonomous systems & robotics

BIG DATA

AI Supercomputer Built by Tapping Data Warehouses for Their Idle Computing Power

MIT Technology Review, 01JUN2015

A company in the US claims to have assembled machine-learning muscle to rival Google by rounding up idle computers. Its power comes from linking up hundreds of thousands of computers over the Internet to work together as if they were a single machine. The company won't say exactly where all the machines it taps into are. But many are idle inside data centers, the warehouse-like facilities that power Internet services such as websites and mobile apps.

Tags: Big data

continued...

"The important thing is not to stop questioning."

ALBERT EINSTEIN

Extracting useful scientific information from social media

PhysOrg.com, 27MAY2015

Researchers in Singapore are developing linguistic processing tools to mine publicly available social media exchanges for meaningful information about social sentiment and translating this knowledge into social technologies that can be deployed in solving real-world problems.

Tags: Big data

COMMUNICATIONS TECHNOLOGY

Infrared detector to free up Internet of tomorrow

Physics World, 29MAY2015

Most current cables work at bands centred on 1.3 or 1.5 μm, and transmit data over about 100 different channels within each band. An international team of researchers (Canada, UK) have built and tested a photodetector that would help to open up at least another 100 channels by operating at longer wavelengths, exploiting a band lying in the mid-infrared region at around 2 μm. TECHNICAL ARTICLE

Tags: Communications Technology

New Wi-Fi antenna enhances wireless coverage

Science Daily, 29MAY2015

According to researchers in Malaysia the plasma found in a standard 62-centimetre light tube is highly conductive and signal measurements on a test device show that it is strong and stable. Thus plasma compares favourably with standard metal Wi-Fi antennas for transmitting and receiving. Multiple antennas could be connected to a single router through a building's electrical wiring using existing Wi-Fi standards.

Tags: Communications Technology

ENVIRONMENTAL SCIENCE

Berkeley Lab Scientist Invents New Technique to Understand Cloud Behavior

Lawrence Berkeley National Laboratory, 27MAY2015

With two off-the-shelf digital cameras situated about 1 kilometer apart, researchers at Lawrence Berkeley National Laboratory are able to collect three-dimensional data on cloud behavior. The photos allow a better understanding of basic cloud behavior which will allow scientists to improve global climate models.

Tags: Environmental science, Climatology

Global climate on verge of multi-decadal change

Science Daily, 27MAY2015

According to a study by researchers in the UK, the change to the new set of climatic conditions is associated with a cooling of the Atlantic, and is likely to bring drier summers in Britain and Ireland, accelerated sea-level rise along the northeast coast of the United States, and drought in the developing countries of the Sahel region. TECHNICAL ARTICLE

Tags: Environmental science, Climatology, S&T UK

IMAGING TECHNOLOGY

Team develops camera that uses sensors with just 1,000 pixels

PhysOrg.com, 02JUN2015

A team of researches in the US (Carnegie Mellon University, Columbia University) has developed a new camera, called LiSens, which takes a low-resolution sensor and by the use of novel optic makes it capable of sensing scenes at a resolution that is higher than that of the sensor. This is achieved by focusing the scene onto a digital micro-mirror array (DMD) and, subsequently, focusing the DMD onto the low-resolution sensor. The DMD is an array of tiny mirrors that can direct light towards or away from the sensor.

Tags: Imaging technology

INFORMATION TECHNOLOGY

Quantum leaps

PhysOrg.com, 01JUN2015

Researchers in Australia are focusing on the theoretical foundations for quantum software. Once these foundations have been laid, software can then be created and implemented. The establishment of a fully-fledged Floyd-Hoare logic for quantum programming has assisted with bringing the team one step closer.

Tags: Information Technology, Quantum science

Is This the First Computational Imagination?

MIT Technology Review, 28MAY2015

The ability to read a description of a scene and then picture it has always been uniquely human. Not anymore. Researchers in Japan unveil a machine that can translate a description of an object into an image. In other words, their computer can conjure an image of an external object not otherwise present. They treated visual words as pieces of a puzzle and solved the problem by fitting them all together to make a picture. TECHNICAL ARTICLE

Tags: Information Technology, S&T Japan

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MATERIALS SCIENCE

New electronics? Black Phosphorus Reveals Its Secrets

Science Daily, 02JUN2015

An international team of researchers (Canada, France) succeeded in preventing two-dimensional layers of black phosphorus from oxidating. In so doing, they have opened the doors to exploiting their striking properties in a number of electronic and optoelectronic devices. 2D phosphane (single atomic layer of black phosphorus) brings together two very sought-after properties for device design—high mobility and its interaction with light dependence on the number of atomic layers used. TECHNICAL ARTICLE

Tags: Materials science, Advanced materials

Physicists advance understanding of electrical vortices in certain materials

PhysOrg.com, 26MAY2015

A team of researchers in the US (University of Arkansas, Lawrence Livermore National Laboratory) reports that the existence of an electrical vortex increases the band gap—the major factor determining a material's conductivity. By changing the temperature, the band alignment can be changed. Imagine having the same system having two different band alignments, which can lead to different applications. TECHNICAL ARTICLE

Tags: Materials science

Featured Resource

Nature RSS feeds

Feeds provide headlines, summaries and links for all the new content published on their respective sites.

PHOTONICS

Laser beam compressed into thin filament

Science Daily, 29MAY2015

Researchers in Russia presented their research on the process of laser pulse filamentation—the effect produced when a laser beam propagating in air focuses into a filament. They discovered how this process influences the preliminary transition of a beam passing through quartz glass, which has applications in the field of nonlinear optics.

Tags: Photonics, S&T Russia

Military technology: Laser weapons get real

Nature News, 27MAY2015

The Boeing prototype is just one of several such weapons developed in recent years in both the United States and Europe. The output of the fibre weapons is measured in kilowatts. The modern weapons are on the brink of real-world deployment. Tests such as those of the Boeing system show that the lasers have enough power to overcome threats from terror groups—at a fraction of the price of conventional defences.

Tags: Photonics, Military technology

QUANTUM SCIENCE

Endless oscillations, destined never to relax: A theoretical study on quantum systems

Science Daily, 27MAY2015

According to classical physics, the universe tends to equilibrium but quantum systems are destined to shift constantly between different configurations without ever finding peace. A theoretical study conducted by an international team of researchers (UK, Italy) illustrates this dramatic difference and explains that in order to be described correctly one-dimensional quantum systems should be thought of as being defined on discrete points in space. Research opens up interesting scenarios on the control of extensive quantum systems and their use for future memory architectures and quantum algorithms. TECHNICAL ARTICLE

Tags: Quantum science

Experiment confirms quantum theory weirdness

PhysOrg.com, 27MAY2015

Quantum physics predicts that whether you observe wave like behavior (interference) or particle behavior (no interference) depends only on how it is actually measured at the end of its journey. Researchers in Australia report that this is what they found in their experiments. TECHNICAL ARTICLE

Tags: Quantum science, S&T Australia

Physicists solve quantum tunneling mystery

Science Daily, 27MAY2015

An international team of researchers (Australia, UK, Germany) has solved a mystery of quantum mechanics, and found that quantum tunneling is an instantaneous process. The new theory could lead to faster and smaller electronic components, for which quantum tunneling is a significant factor. It will also lead to a better understanding of diverse areas such as electron microscopy, nuclear fusion and DNA mutations. TECHNICAL ARTICLE

Tags: Quantum science, S&T Australia

Quantum computer emulated by a classical system

PhysOrg.com, 27MAY2015

Researchers at UT Austin present a novel approach to emulating a universal quantum computer with a classical system, one that uses a signal of bounded duration and

continued...

amplitude to represent an arbitrary quantum state. The signal may be of any modality (e.g., acoustic, electromagnetic, etc), but they focus their discussion on electronic signals. TECHNICAL ARTICLE

Tags: Quantum science

Quantum magnetic ordering: Moving out of equilibrium

Science Daily, 27MAY2015

To study quantum magnetic ordering, researchers at the University of Maryland studied the magnetic and motional dynamics of atoms in a specially designed laser-based lattice that looks like a checkerboard. Magnetic ordering is believed to be intimately related to high-temperature superconductivity and also has significance in other massively connected quantum systems. TECHNICAL ARTICLE

Tags: Quantum science

Scientists have found a way to end aluminium's quantum monopoly

Science Alert, 27MAY2015

The only material we can currently use to successfully read quantum information is aluminium. But the ideal quantum computers will need to work within a very narrow range of conditions in which aluminium stops being able to read quantum information. Researchers in the Netherlands have finally overcome it by demonstrating that they can read the quantum information of the quantum computing particle-of-choice, Marjorana fermion, using niobium titanium nitride (NbTiN). TECHNICAL ARTICLE

Tags: Quantum science

Theory of everything? How spacetime is built by quantum entanglement

Science Daily, 27MAY2015

An international team of researchers (Japan, USA) has made a significant step toward unifying general relativity and quantum mechanics by explaining how spacetime emerges from quantum entanglement in a more fundamental theory. Their work sheds new light on the relation between quantum entanglement and the microscopic structure of spacetime by explicit calculations. The interface between quantum gravity and information science is becoming increasingly important for both fields. TECHNICAL ARTICLE

Tags: Quantum science

S&T POLICY

Why France is building a mega-university at Paris-Saclay to rival Silicon Valley

The Conversation, 27MAY2015

The rationale behind Paris-Saclay is to reach the same size and level of excellence as Harvard, MIT, Oxford and Cambridge. With its higher education institutions already attracting 15% of the potential research budget in France, Paris-Saclay should give birth to Europe's top multi-disciplinary university, and bring a well-needed boost to France after years of shame caused by poor performance in global university rankings.

Tags: S&T policy, S&T France

SENSORS

CMU researchers develop 3-D scanning technology that detects light interaction

PhysOrg.com, 03JUN2015

The 3D scanning technology, developed by researchers at the Carnegie Mellon University, can capture not just the 3D shape of an object it estimates, but the bidirectional reflectance distribution function at each surface element of the object in isolation. The proposed solution relies on a simple idea: suppose we know how many commonly occurring materials interact with light, then we can try to explain the visual properties of an object with unknown composition in terms of the behavior exhibited by the commonly occurring materials.

Tags: Sensors

Device can track soldier movements without GPS

Defense Systems, 29MAY2015

The Warfighter Integrated Navigation System (WINS), being developed at the Communications Electronics Research Development and Engineering Center, uses a variety of sensors to track a soldier's movement from a last known location, recording footsteps, speed, time, altitude and other factors to show the soldier's location on a map. Even if the enemy or terrain is denying you GPS, you can still get known location on here so it will show up on your Nett Warrior device or your command and control system.

Tags: Sensors, Government S&T, Military technology ■

About This Publication

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