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S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

Feature Articles

Invisibility cloaks closer thanks to 'digital metamaterials'

PhysOrg.com, 15SEP2014

Now you see him ... Eric Tastad/ Flickr, CC BY-NC-SA

Through the use of simulations in two-dimensional space, researchers at the University of Pennsylvania explored the possibility of creating metamaterials with only two specially chosen component parts, called metamaterial bits—analogous to the 1 and 0 "bits" of binary computer code. The arrangement of metamaterial bits represents the "digitising" of metamaterials. They used nano-sized pieces of silver and silica (glass) as their repeating metamaterial bits. TECHNICAL ARTICLE

Tags: Advanced materials, Featured Article

Physicists find a new way to push electrons around

MIT News, 11SEP2014

An international team of researchers (USA, UK) found that when a sheet of graphene is placed atop another two-dimensional material, electrons move sideways, perpendicular to the electric field. This happens even without the influence of a magnetic field. This type of behavior might lead to new types of transistors and electronic circuits that could prove highly energy-efficient. TECHNICAL ARTICLE

Tags: Materials science, Particle physics, Featured Article

'Talking' and 'listening' to atoms: Scientists make acoustic waves couple to an artificial atom

Science Daily, 11SEP2014

An international team of researchers (Sweden, USA) has succeeded in making acoustic waves couple to an artificial atom designed to both emit and absorb energy in the form of sound. According to theory, the sound from the atom is divided into quantum particles. Since sound moves much slower than light, the acoustic atom opens entire new possibilities for taking control over quantum phenomena. TECHNICAL ARTICLE 1, 2

Tags: Quantum science, Breakthrough technology, Featured Article

S&T News Articles

ADVANCED MANUFACTURING

Making Innovation

MIT Technology Review, 16SEP2014

Manufacturing will make its most essential economic contribution as an incubator of innovation: the place where new ideas become new products. Thanks to advanced manufacturing technologies, that place can in theory be pretty much anywhere. In practice, however, advanced manufacturers thrive best in an ecosystem of suppliers and experienced talent.

Tags: Advanced manufacturing

ADVANCED MATERIALS

Smaller artificial magnetic conductors allow for more compact antenna hardware

PhysOrg.com, 12SEP2014

An international team of researchers (the Netherlands, Spain) presents a comprehensive analysis of all the parameters involved in miniaturisation strategies, identifying the existing trade-offs. Taking these into account they achieved a 40% reduction of the largest dimension. Their proposed design will allow for better performance, utilization of bandwidth and easier integration with other systems. TECHNICAL ARTICLE

Tags: Advanced materials, Sensors

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BACK TO TOP

A Super-Strong and Lightweight New Material

MIT Technology Review, 11SEP2014

Researchers at Caltech found that by carefully designing nanoscale struts and joints, they could make ceramics, metals, and other materials that can recover after being crushed, like a sponge. The materials are very strong and light enough to float through the air like a feather. The new materials might be particularly interesting for use in batteries. TECHNICAL ARTICLE

Tags: Advanced materials

Graphene paints a corrosion-free future

Nanotechweb, 11SEP2014

Graphene oxide solutions can be used to paint various surfaces ranging from glass to metals to even conventional bricks. Researchers in the UK show that it is possible to tightly close nanocapillaries using simple chemical treatments, which makes graphene films even stronger mechanically as well as completely impermeable to everything: gases, liquids or strong chemicals. TECHNICAL ARTICLE

Tags: Advanced materials, S&T UK

New method to detect prize particle for future quantum computing

Science Daily, 10SEP2014

An international team of researchers (UK, Israel) believes that they have uncovered a key method for detection of the Majorana particle, potentially enabling reliable Q-Bits to be developed. This new research proposes using photons and super-conducting circuits to probe and measure semiconductor nanowires, where it is thought these particles exist at certain controlled conditions. TECHNICAL ARTICLE

Tags: Advanced materials, Breakthrough technology

Graphene gets a 'cousin' in the shape of germanene

PhysOrg.com, 09SEP2014

An international team of researchers (Spain, Germany, France) has successfully synthesized the 2-D material germanene. Dubbed a 'cousin of graphene', the material which is made up of just a single layer of germanium atoms, is expected to exhibit impressive electrical and optical properties and could be widely integrated across the electronics industry in the future. TECHNICAL ARTICLE

Tags: Advanced materials, S&T EU

AUTONOMOUS SYSTEMS & ROBOTICS

Video Friday: Massive Manipulator, Soft Exoskeleton, and Jetpack Augmentation

IEEE Spectrum, 12SEP2014

Curiosity has finally, after two years and 9 kilometers of driving, officially reached the base of Mt. Sharp.

Tags: Autonomous systems & robotics

Making drones more customizable

MIT News, 11SEP2014

A start-up company has developed a platform—hardware, software, and cloud services—that lets manufacturers pick and choose various components and application-specific software to add to commercial drones for multiple purposes. The key component is the start-up's Linux-based autopilot device, a small red box that is installed into all of a client's drones.

Tags: Autonomous systems & robotics

BIG DATA

Big Data-Driven Innovation: Disruption vs. Optimization

Wired, 16SEP2014

Data analytics in support of human decision making has one flaw—the human. This weak link in the data-driven agility chain becomes apparent as we move to Big Data: as the data grow so too do the results of the analyses, and yet people have a limited attention span and with it, the ability to process information.

Tags: Big data, Disruptive technology

BIOTECHNOLOGY

Brandeis physicists unlock secrets of the 2-D world and edge closer to artificial cells

PhysOrg.com, 15SEP2014

Researchers at Brandeis University engineered a Frankenstein-like, microscopic synthetic sac, stitched together from different kinds of biomolecules, that can move and change shape on its own. It's an active nematic vesicle and it could be the first step toward building artificial cells. TECHNICAL ARTICLE

Tags: Biotechnology

COMMUNICATIONS TECHNOLOGY

Scientists twist radio beams to send data: Transmissions reach speeds of 32 gigabits per second

Science Daily, 16SEP2014

Building on previous research that twisted light to send data at unheard-of speeds, scientists at the University of Southern California have developed a similar technique with radiowaves. They reached data transmission rates of 32 gigabits per second across 2.5 meters of free space. TECHNICAL ARTICLE

Tags: Communications Technology

continued...

"Discovery consists of seeing what everybody has seen and thinking what nobody has thought." ALBERT SZENT-GYÖRGYI

Engineer aims to connect the world with ant-sized radios

PhysOrg.com, 10SEP2014

Researchers at Stanford University have built a radio the size of an ant, a device so energy efficient that it gathers all the power it needs from the same electromagnetic waves that carry signals to its receiving antenna—no batteries required. It is cheap enough to become the missing link between the Internet and "Internet of Things." TECHNICAL ARTICLE

Tags: Communications Technology

First 500 GHz photon switch built

Science Daily, 10SEP2014

To build the new switch, researchers at UC San Diego developed a new measurement technique capable of resolving sub-nanometer fluctuations in the fiber core. This was critical because local fiber dispersion varies substantially, particularly over long device lengths. In the experiment, a three-photon input was used to manipulate a Watt-scale beam at a speed exceeding 500 Gigahertz. TECHNICAL ARTICLE

Tags: Communications Technology, Photonics

Wireless experts create multiuser, multiantenna scheme to make most of UHF band

PhysOrg.com, 09SEP2014

Combining several proven technologies that are already widely used in wireless data transmission, researchers at Rice University have found a way to make the most of the unused UHF TV spectrum by serving up fat streams of data over wireless hotspots that could stretch for miles.

Tags: Communications Technology

ENVIRONMENTAL SCIENCE

Where to grab space debris: Algorithm analyzes the rotation of objects in space

Science Daily, 10SEP2014

Researchers at MIT describe a new algorithm for gauging the rotation of objects in zero gravity using only visual information. Where space objects' centers of mass are, and how their mass is distributed is crucial to any number of actual or potential space missions, from cleaning up debris in the geosynchronous orbit favored by communications satellites to landing a demolition crew on a comet.

Tags: Environmental science, Space technology

FORECASTING

Engage today to shape tomorrow—5th International Conference on Future-Oriented Technology Analysis (FTA), (November 26-27, 2014, in Brussels)

EU Research, 15SEP2014

There are three main conference themes: FTA and Innovation Systems, Creative interfaces for forward looking activities, and Cutting edge FTA approaches. The conference is open to practitioners, researchers, and decision makers from around the globe.

Tags: Forecasting, S&T EU

MATERIALS SCIENCE

An optical cage for atoms

Nanowerk, 12SEP2014

An international team of researchers (Japan, France, UK, Italy, Ukraine, USA) has developed a method to confine atoms in an 'optical lattice' formed inside a hollow-core optical fiber. Atoms passing down the central channel are confined within the periodicity of the three-dimensional optical lattice. This confinement keeps the atoms isolated and protected from unwanted collisions. TECHNICAL ARTICLE

Tags: Materials science, Particle physics

Magnetism intensified by nanoscale defects

Nanowerk, 12SEP2014

As the size of magnetic components approach nanoscale dimensions, magnetic properties can disappear. Using their split-illumination electron holography technique, researchers in Japan amplified magnetic flux densities in the antiphase boundaries in iron-aluminum alloy. The finding could lay the groundwork for the engineering of nanomagnets with APB-induced activity. TECHNICAL ARTICLE

Tags: Materials science, S&T Japan

Advancing understanding of graphene's friction properties

Science Daily, 10SEP2014

Adding fluorine to graphene had been reported to vastly increase the friction experienced when sliding against the material. Through a combination of physical experiments and atomistic simulations, researchers at the University of Pennsylvania have discovered the mechanism behind this surprising finding, which could help researchers better design and control the surface properties of new materials. TECHNICAL ARTICLE

Tags: Materials science, Advanced materials

continued...

MICROELECTRONICS

The future face of molecular electronics

Science Daily, 16SEP2014

An international team of researchers (Japan, Taiwan) has identified a potential candidate for use in small-scale electronics: a molecule called picene. They characterized the structural and electronic properties of a thin layer of picene on a silver surface, demonstrating the molecule's potential for electronic applications. TECHNICAL ARTICLE

Tags: Microelectronics

Electronics that need very little energy? Nanotechnology used to help cool electrons with no external sources

Science Daily, 10SEP2014

Researchers at the University of Texas in Arlington used a nanoscale structure—which consists of a sequential array of a source electrode, a quantum well, a tunneling barrier, a quantum dot, another tunneling barrier, and a drain electrode—to suppress electron excitation and cool it to minus 228 degrees Celsius. The technique could enable electronic devices to function with very little energy. TECHNICAL ARTICLE

Tags: Microelectronics

Featured Resource

IOP Asia-Pacific

Research highlights from Korea, India, Pakistan, Thailand, Taiwan, Japan, China, Vietnam, Australia and New Zealand. RSS

NEUROSCIENCE

Owls provide clues on how humans focus attention

Science Daily, 11SEP2014

The tectum is a key hub in the midbrain of all vertebrate animals and is important for the control of spatial attention. Using a computer model of the neurons in the tectum, researchers at Johns Hopkins University were able to provide an explanation for how top-down information may fine-tune the ability of the brain to make decisions about where to pay attention. TECHNICAL ARTICLE

Tags: Neuroscience

QUANTUM SCIENCE

Elusive quantum transformations found near absolute zero

Science Daily, 15SEP2014

To isolate quantum fluctuations that define the properties of a metallic material, researchers at DOE's Brookhaven National Laboratory probed it at temperatures colder than interstellar space. The research provides new methods to identify and understand promising new materials, including superconductors. TECHNICAL ARTICLE

Tags: Quantum science, Government S&T, Materials science

Direct generation of three-photon polarization entanglement

Nature Photonics, 14SEP2014

An international team of researchers (Canada, USA, Sweden) shows the direct production of polarization-entangled photon triplets by cascading two entangled downconversion processes. These results represent a significant breakthrough for entangled multi-photon state production by eliminating the constraints of outcome post-selection, providing a novel resource for optical quantum information processing.

Tags: Quantum science, Photonics

Quantum teleportation on a photonic chip

Nature Photonics, 14SEP2014

An international team of researchers (UK, Italy, China, the Netherlands) report a fully integrated implementation of quantum teleportation in which all key parts of the circuit—entangled state preparation, Bell-state analysis and tomographic state measurement—are performed on a reconfigurable photonic chip. They show that a novel element-wise characterization method is critical to the mitigation of component errors.

Tags: Quantum science

Fast implementation of length-adaptive privacy amplification in quantum key distribution

IOP Science, 13SEP2014

By constructing an optimal multiplication algorithm based on four basic multiplication algorithms, an international team of researchers (China, Thailand) developed a fast software implementation of length-adaptive privacy amplification. When the lengths of the input blocks are 1 Mbit and 10 Mbit, the speed of privacy amplification can be as fast as 14.86 Mbps and 10.88 Mbps, respectively. Thus, it is practical for GHz or even higher repetition frequency QKD systems.

Tags: Quantum science

continued...

Scientists fabricate single-photon sources in solid matter

Science Daily, 11SEP2014

An international team of researchers (Germany, Japan) has fabricated single-photon sources of silicon vacancy centers in diamond by introducing them at extremely low concentrations. They obtained nearly identical emission spectra, with a spectral overlap of 91%, between two photons emitted from two single-photon sources that were fabricated at different locations in a crystal. TECHNICAL ARTICLE

Tags: Quantum science, Photonics

The quantum revolution is a step closer: New way to run a quantum algorithm

Science Daily, 11SEP2014

Researchers in the UK have discovered a new way to run a quantum algorithm using much simpler methods than previously thought. These findings could dramatically bring forward the development of a 'quantum computer' capable of beating a conventional computer. TECHNICAL ARTICLE

Tags: Quantum science, S&T UK

Optical levitation of microdroplet containing a single quantum dot

arXiv, 30AUG2014

Efficient coupling of quantum dots requires the precise positioning of the QD in an optical cavity. Researchers in Japan present a technique to overcome this challenge by demonstrating optical levitation. Bright single-photon emission from the levitated QD was observed for more than 200 s. The technique could advance research on QD-based cavity quantum electrodynamics.

Tags: Quantum science, S&T Japan

S&T POLICY

China to launch second space lab in 2016, official says

PhysOrg.com, 10SEP2014

They are going to launch the spacelab Tiangong-2 in 2016, and then launch Shenzhou-11 and then Tianzhou-1 cargo spaceship to dock on the spacelab. They plan to launch an experimental core space station module in 2018 and finish construction of a Chinese space station around 2022.

Tags: S&T policy, S&T China, Space technology

SCIENCE WITHOUT BORDERS

The Mathematics of Ebola Trigger Stark Warnings: Act Now or Regret It

Wired, 14SEP2014

An international team of researchers (Japan, USA) attempts to derive what the reproductive rate of Ebola virus has been in Guinea, Liberia and Sierra Leone. They come up with an R of at least 1, and in some cases 2; that is, at certain points, sick persons have caused disease in two others. TECHNICAL ARTICLE

Tags: Science without borders, Mathematics

Index ranks Japan Asia's most efficient innovator (Update)

PhysOrg.com, 12SEP2014

The Asian Development Bank index uses 36 indicators to measure capacity and incentives for innovation, including how many global top 500 universities a country has, the urbanization rate and spending on research and development. The complete rankings: Japan, Finland, South Korea, United States, Taiwan, New Zealand, Hong Kong, Australia, Laos, Singapore, China, Indonesia, Malaysia, India, Thailand, Vietnam, Kazakhstan, Philippines, Sri Lanka, Bangladesh, Fiji, Myanmar, Pakistan, Cambodia.

Tags: Science without borders

Geomagnetic storm mystery solved: How magnetic energy turns into particle energy

Science Daily, 10SEP2014

Magnetic reconnection can trigger geomagnetic storms that disrupt cell phone service, damage satellites and black out power grids. Researchers at DOE's Princeton Plasma Physics Laboratory not only identified how the mysterious transformation takes place, but measured experimentally the amount of magnetic energy that turns into particle energy. TECHNICAL ARTICLE

Tags: Science without borders, Government S&T ■

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