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S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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FEATURE ARTICLES

Physicists stop and store light traveling in an optical fiber

PhysOrg.com, 11MAY2015

Light propagating in a glass fiber can be halted and reemitted later on demand via its interaction with cold cesium atoms in the vicinity of an elongated area. Credit: Julia Fraud – juliafraud.com/ Laboratoire Kastler Brossel

Researchers in France report that they have devised optical memory integrated into an optical fiber. The team created a way to stop and store light that usually propagates in a fiber at a speed of 200,000 kilometers per second. This capability represents an important advance in optical communications and a future quantum Internet. TECHNICAL ARTICLE

Tags: Photonics, Communications Technology, S&T France, Featured Article

New laser-light source to shed light on fundamental physics

Science Daily, 05MAY2015

Introduced by researchers in Germany, Ytterbium: Yttrium-Aluminium-Garnet (Yb:YAG) disk laser emits pulses lasting 7.7 femtoseconds which corresponds to 2.2 wave periods. The average pulse power is 6 Watts and each pulse carries 0.15 microjoules of energy, 1.5 orders of magnitude greater than that attainable with commercial titanium:sapphire lasers. The new laser is capable of producing tens of millions of high-power pulses per second, and it ushers in a new era in the investigation of ultrafast physical processes. TECHNICAL ARTICLE

Tags: Photonics, S&T Germany, Featured Article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

How to make nanofibers using a fridge magnet

Nanowerk, 11MAY2015

An international team of researchers (USA, UK) has developed a method for spinning continuous micro- and nanofibers using a permanent revolving magnet. This fabrication technique utilizes magnetic forces and hydrodynamic features of stretched threads to produce fine nanofibers. The new method provides excellent control over the fiber diameter and is compatible with a range of polymeric materials and polymer composite materials including biopolymers. TECHNICAL ARTICLE

Tags: Advanced manufacturing, Advanced materials

Inkjet printing process for kesterite solar cells

PhysOrg.com, 06MAY2015

The inkjet printing technology developed by an international team of researchers (Germany, Qatar) to produce kesterite thin film absorbers (CZTSSe) minimizes waste and has huge advantages for industrial production. TECHNICAL ARTICLE

Tags: Advanced manufacturing, Solar energy

'Microcombing' creates stronger, more conductive carbon nanotube films

Science Daily, 05MAY2015

An international team of researchers (USA, China) has developed an inexpensive technique called 'microcombing' to align CNTs, which can be used to create large, pure CNT films that are stronger than any previous such films. The technique also improves the electrical conductivity that makes these films attractive for use in electronic and aerospace applications. TECHNICAL ARTICLE

Tags: Advanced manufacturing, CNT

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ADVANCED MATERIALS

Quantum 'gruyeres' for spintronics of the future

Nanowerk, 12MAY2015

Topological insulators exhibit conducting states on their surface which makes them unique. Unfortunately, the characteristics that describe these materials are very subtle and difficult to identify and study. An international team of researchers (Italy, Austria, Germany) explains how such characteristics could be found in materials with more evident properties, thus simplifying research in this field and opening up new possibilities. TECHNICAL ARTICLE

Tags: Advanced materials

Graphene holds key to unlocking creation of wearable electronic devices

PhysOrg.com, 11MAY2015

An international team of researchers (UK, Portugal, Belgium) deposited graphene on copper foil using CVD. They developed a technique to transfer graphene from the copper foils to a polypropylene fibre already commonly used in the textile industry. TECHNICAL ARTICLE

Tags: Advanced materials

Scientists use shape-fixing nanoreactor to make a better fuel cell catalyst

PhysOrg.com, 11MAY2015

Researchers in China have developed a way to synthesize materials with a large number of active sites that also ensures that the active sites are accessible to all of the species (electrons, protons, oxygen, and water molecules, etc.) involved in the reactions. They synthesized highly porous carbon nanomaterials, in which the pores act as open channels to transport various species to their particular active sites within the carbon framework. TECHNICAL ARTICLE

Tags: Advanced materials, S&T China

Spiders Ingest Nanotubes, Then Weave Silk Reinforced with Carbon

MIT Technology Review, 06MAY2015

Researchers in Italy sprayed spiders with water containing the nanotubes or flakes and then measured the mechanical properties of the silk that the spiders produced. They measured fracture strength up to 5.4 GPa, a Young's modulus up to 47.8 GPa and a toughness modulus up to 2.1 GPa. This is the highest toughness modulus for a fibre, surpassing synthetic polymeric high performance fibres (e.g. Kelvar49). TECHNICAL ARTICLE

Tags: Advanced materials, Materials science, S&T Italy

AUTONOMOUS SYSTEMS & ROBOTICS

Video Friday: Robotic Hummingbird, Baxter Treats Ebola, and Dexterous Bomb-Squad Robot

IEEE Spectrum, 08MAY2015

At Oregon State University's Ebola Treatment Unit, they're working with a Baxter robot that can be teleoperated to manipulate common medical objects.

Tags: Autonomous systems & robotics

BIOTECHNOLOGY

Using a new laser process to custom shape optical fibers

Science Daily, 11MAY2015

Modern medicine relies on optical fibers to cauterize unhealthy veins in a minimally invasive way. Researchers in Germany have developed a new, laser-based process for precisely shaping this sort of optical fiber. They use the FiberTurningLaser, which is a laser for glass processing. The method enables the first automated series production.

Tags: Biotechnology, Medical Sciences, S&T Germany

Tiny silicone spheres come out of the mist: Targeted medicine?

Science Daily, 06MAY2015

Researchers at the University of Illinois at Urbana-Champaign used ultrasonic spray pyrolysis to create a mist of ultrafine droplets. The mist containing all the ingredients of silicone is sent through a heated tube, which solidifies the mist into microspheres which are roughly 100 times smaller than any previously reported. They made silicone microspheres with a variety of properties for different applications. TECHNICAL ARTICLE

Tags: Biotechnology

Soft robot: Shaping itself and moving with own internally generated power?

Science Daily, 05MAY2015

To mimic the euglena's mobility, researchers at the University of Pittsburgh used polymer gels containing spirobenzopyran (SP) since these materials can be morphed into different shapes with the use of light and Belousov-Zhabotinsky (BZ) gels that not only undergo periodic pulsations, but can be driven to move in the presence of light. TECHNICAL ARTICLE

Tags: Biotechnology, Biomimetics

continued...

"The whole of science is nothing more than a refinement of everyday thinking."

ALBERT EINSTEIN

CYBER SECURITY

Queen's University leading the way in pioneering, European cyber-security initiative

PhysOrg.com, 07MAY2015

The EU sponsored SAFEcrypto project will draw together cryptographers and other IT experts from Germany, France, Switzerland, Britain and Ireland to devise urgent security solutions capable of withstanding attack from the next generation of hackers. The project will concentrate on three main areas: Protecting information passed via satellites, Protecting public-safety communications systems, and Safeguarding the privacy of data collected by municipal authorities.

Tags: Cyber security, S&T EU

Self-destructing virus kills off PCs

BBC News, 05MAY2015

A computer virus that tries to avoid detection by making the machine it infects unusable has been found. If Rombertik's evasion techniques are triggered, it deletes key files on a computer, making it constantly restart. Analysts said Rombertik was "unique" among malware samples for resisting capture so aggressively. On Windows machines where it goes unnoticed, the malware steals login data and other confidential information.

Tags: Cyber security

ENERGY

Better battery for storing solar energy?

Science Daily, 05MAY2015

An international team of researchers (Denmark, Italy) is working with molecules known as the Dihydroazulene-Vinylheptafulvene system which stores energy by changing shape. They managed to double the energy density in a molecule that can hold its shape for a hundred years. Now they are working on getting it to release the energy again. TECHNICAL ARTICLE

Tags: Energy, Solar energy

ENVIRONMENTAL SCIENCE

A climate signal in the global distribution of copper deposits

PhysOrg.com, 11MAY2015

A team of researchers in the US (University of Idaho, University of Michigan) examined data on the age and number of exposed porphyry copper deposits worldwide. When they compared those data to the climate in each region, they noticed a pattern: The youngest deposits are in areas of high rainfall, such as the tropics, where erosion was rapid. Deposits are older in dry areas that have low rates of erosion. TECHNICAL ARTICLE

Tags: Environmental science

FORECASTING

Earthquakes expose limits of scientific predictions

NSF News, 07MAY2015

Science and mathematics have not reached a point where they can forecast with certainty the exact time and specific severity of these cataclysmic events—and may never do so. According to researchers at UC Los Angeles the best we can do is make an assessment of there being a heightened risk in a certain geographic area over a certain window of time. We can determine a sense of what is likely to occur, but we will never know exactly.

Tags: Forecasting

INFORMATION TECHNOLOGY

DNA computing

PhysOrg.com, 06MAY2015

Researchers in Singapore built a programmable DNA-based processor that performs two computing tasks at the same time. On a map of six locations and multiple possible paths, it calculated the shortest routes between two different starting points and two destinations. The researchers say that in addition to cost- and time-savings over other DNA-based computers, their system could help scientists understand how the brain's "internal GPS" works. TECHNICAL ARTICLE

Tags: Information Technology

MATERIALS SCIENCE

Separating rare earth metals with UV light

PhysOrg.com, 11MAY2015

Researchers in Belgium have developed ionic liquid technology to recycle europium and yttrium from collected fluorescent lamps and low-energy light bulbs. Their method recycles the red lamp phosphor as a whole to reuse the powder in lamps. The advantages of UV light are that it does not leave behind any harmful chemicals in the liquid and that the separation efficiency and purity in synthetic mixtures is very high. TECHNICAL ARTICLE

Tags: Materials science

continued...

MEDICAL SCIENCES

Cotton fibres instead of carbon nanotubes

PhysOrg.com, 07MAY2015

An international team of researchers (Switzerland, USA) reports that cellulose nanofibres are not harmful: the analysed lung cells showed no signs of acute stress or inflammation. But there were clear differences between short and long fibres: the lung cell system efficiently eliminated short fibres while longer fibres stayed on the cell surface. Tests involving carbon nanotubes have shown that lung cells lose their equilibrium when they are faced with long tubes because they try to incorporate them into the cell to no avail. TECHNICAL ARTICLE

Tags: Medical Sciences, Advanced materials

Featured Resource

Perry-Castañeda Library Map Collection (UT Austin)

An online collection of historical maps, worldwide coverage, and an extensive directory of links to other map sites.

MICROELECTRONICS

Channeling valleytronics in graphene

Science Daily, 06MAY2015

Combining near-field infrared nanometer-scale microscopy and low-temperature electrical transport measurements, researchers at the Lawrence Berkeley National Laboratory have recorded the first experimental observations of 1D ballistic electron conducting channels at bilayer graphene domain walls. Like spintronics, valleytronics offers a tremendous advantage in data processing speeds over the electrical charge used in classical electronics. TECHNICAL ARTICLE

Tags: Microelectronics, Government S&T

First field-effect transistors on hybrid perovskites fabricated for first time

Science Daily, 05MAY2015

A team of researchers in the US (Wake Forest University, University of Utah) reports the fabrication and room-temperature operation of FETs based on the hybrid perovskites. They obtained balanced electron and hole transport with mobilities of ~1 cm^2/Vs. They found that the yield, as well as the operational and environmental stability of the fabricated transistors is limited. TECHNICAL ARTICLE

Tags: Microelectronics, Advanced materials

NEUROSCIENCE

An important step in artificial intelligence with metal-oxide memristors

Nanowerk, 12MAY2015

A team of researchers in the USA (UC Santa Barbara, Stony Brook University) has demonstrated the functionality of a simple artificial neural circuit of about 100 artificial synapses which performed a simple version of a typical human task: image classification. Key to this technology is the memristor. TECHNICAL ARTICLE

Tags: Neuroscience, Artificial intelligence

We're figuring out how to achieve brain-to-brain communication -- here's what that could help us do

Science Alert, 08MAY2015

According to a thorough look at the current state of brain-to-brain communication in a Smithsonian magazine article, the sort of information we can send from one mind to another is very basic. Other, more precise technologies exist that might enable more complex thoughts to be sent, but they haven't been proven to be safe—yet.

Tags: Neuroscience

Popular electric brain stimulation method detrimental to IQ scores

Science Daily, 05MAY2015

Researchers at the University of North Carolina report that using less common alternating current stimulation, called (tACS), significantly boosted creativity, likely because they used it to target the brain's natural electrical alpha oscillations, which have been implicated in creative thought. TECHNICAL ARTICLE

Tags: Neuroscience

PHOTONICS

New thin, flat lenses focus light as sharply as curved lenses

PhysOrg.com, 09MAY2015

Researchers at Caltech have created a new type of lens known as high-contrast transmitarray. Made of silicon, the microlens is studded with silicon "posts" of varying sizes. Depending on their heights and thicknesses, the posts focus on different wavelengths of light. The lenses can be manufactured using industry-standard techniques for making computer chips, setting the stage for their incorporation into electronics such as cameras and microscopes, as well as in novel devices. TECHNICAL ARTICLE

Tags: Photonics

QUANTUM SCIENCE

Magic wavelengths

Nanowerk, 11MAY2015

Rydberg atoms might be just the thing for processing quantum information but they are often difficult to handle.

continued...

One approach is to search for special wavelengths—"magic wavelengths"—at which atoms can be trapped and excited into Rydberg states without disturbing them. A new experiment by a team of researchers in the US (NIST, University of Nevada, University of Delaware) bears out high-precision calculations predicting the existence of specific magic wavelengths. TECHNICAL ARTICLE

Tags: Quantum science

Quantum shortcut could speed up many quantum technologies

PhysOrg.com, 08MAY2015

An international team of researchers (UK, Italy, Singapore) has devised a new hybrid method for preparing quantum states for many-body systems that combines shortcuts to adiabaticity (STA) with optimal control. The main advantage of the new method is that it can achieve nearly perfect STA performance yet allows for significant simplification by not requiring complete knowledge of the underlying mechanisms. The method shows that it's possible to speed up quantum state preparation at a low enough cost to justify the quantum shortcut. TECHNICAL ARTICLE

Tags: Quantum science

Electrons corralled using new quantum tool

Science Daily, 07MAY2015

An international team of researchers (USA, UK, Japan) has succeeded in creating a new "whispering gallery" effect for electrons in a sheet of graphene—making it possible to precisely control a region that reflects electrons within the material. They say the accomplishment could provide a basic building block for new kinds of electronic lenses, as well as quantum-based devices that combine electronics and optics. TECHNICAL ARTICLE

Tags: Quantum science

SCIENCE WITHOUT BORDERS

European space agencies inaugurate altered-gravity aircraft

PhysOrg.com, 11MAY2015

The aircraft offers more than just weightlessness, by changing the thrust and angle of attack, the team of pilots flying the plane can recreate other gravity levels such as those found on the Moon or Mars. As the experiments invariably pass through hypergravity and normal gravity during each flight, researchers can incorporate each phase into their experiment as controls or to compare sets with different gravity levels.

Tags: Science without borders, S&T EU

SENSORS

Wireless video interface between infrared weapon sight with real time integration with night vision goggles

Next Big Future, 11MAY2015

In partnership with the U.S Army Night Vision and Electronic Sensors Directorate, BAE Systems has developed a wireless video interface between the weapon sight and goggle so imagery from the weapon sight will be transmitted to the goggle and viewed via the goggle display in real time. This Rapid Target Acquisition capability eliminates the need for soldiers to rely on aiming lasers, so they are able to remain covert.

Tags: Sensors, Military technology

Search and rescue tool that pinpoints buried victims developed

Science Daily, 08MAY2015

Finding Individuals for Disaster and Emergency Response (FINDER) is a radar technology, developed by DHS and NASA, designed to detect heartbeats of victims trapped in wreckage. In a demonstration, FINDER was successful in locating a person buried in 30 feet of mixed concrete, rebar, and gravel rubble from a distance of over 30 feet. Its locator feature can help pinpoint the location of the victim to within about five feet—depending on the type of rubble.

Tags: Sensors, Government S&T

New centimeter-accurate GPS system could transform virtual reality and mobile devices

Science Daily, 06MAY2015

Researchers at UT Austin have developed a powerful and sensitive software-defined GPS receiver called GRID, to extract so-called carrier phase measurements from low-cost antennas. GRID currently operates outside the phone, but it will eventually run on the phone's internal processor. The researchers anticipate that their software's ability to leverage low-cost antennas will reduce the overall cost of centimeter accuracy, making it economically feasible for mobile devices.

Tags: Sensors ■

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