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S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

Feature Articles

Laser Communications Set for Moon Mission

PhysOrg.com, 30JUL2013

ESA's Optical Ground Station (OGS) is 2400 m above sea level on the volcanic island of Tenerife. Visible green laser beams are used for stabilising the sending and receiving telescopes on the two islands. The picture is a multiple exposure also including Tenerife's Teide volcano and the Milky Way in the background. Credit: IQOQI Vienna, Austrian Academy of Sciences

Later this year, ESA's observatory in Spain will use laser beams to communicate with a NASA Moon orbiter for a live space demonstration in October, once NASA's Lunar Atmosphere and Dust Environment Explorer—LADEE—begins orbiting the Moon.

Tags: Communications Technology, Government S&T, Featured Article

Caltech Researchers Create a Microchip Capable of "Healing" after Damage and Optimizing Its Performance

MIT Technology Review, 26JUL2013

Caltech researchers have demonstrated a complex integrated circuit that survives substantial damage by reconfiguring the way it processes information. The chip does not physically repair flaws; it uses a second processor to come up with new ways to perform a task in spite of the damage. The chip can also be programmed to prioritize energy savings or speed. TECHNICAL ARTICLE

Tags: Microelectronics, Featured Article

Optical detection of epigenetic marks

Nanowerk, 25JUL2013

Researchers in Israel have reported the first direct visualization of individual epigenetic modifications in the genome. This is a technical and conceptual breakthrough as it allows not only to quantify the amount of modified bases but also to pin point and map their position in the genome. TECHNICAL ARTICLE

Tags: Biotechnology, Biology, Featured Article

World-Changing Technology Enables Crops to Take Nitrogen from the Air

Science Daily, 25JUL2013

Researchers in the UK have developed a unique method of putting nitrogen-fixing bacteria into the cells of plant roots. The major breakthrough came when they found a specific strain of nitrogen-fixing bacteria in sugar-cane which they discovered could intracellularly colonise all major crop plants.

Tags: Biotechnology, Featured Article

S&T News Articles

ADVANCED MANUFACTURING

Nanoparticles Emitted from 3D Printers Could Pose a Risk

IEEE Spectrum, 29JUL2013

Researchers from the Illinois Institute of Technology demonstrated that common commercially available 3-D printers available for home use emitted between 20 and 200 billion ultrafine particles (UFPs) per minute. Studies have demonstrated that thermal decomposition byproducts from ABS (acrylonitrile butadiene styrene) processing have toxic effects in mice and rats. TECHNICAL ARTICLE

Tags: Advanced manufacturing

continued...

BACK TO TOP

Printed nanostructured electrodes boost the energy storage of supercapacitors

Nanowerk, 29JUL2013

Researchers at the University of Central Florida have developed a unique three-step process to "print" large–area nanostructured electrodes, structures necessary to improve electrical conductivity and boost performance of the supercapacitor. TECHNICAL ARTICLE

Tags: Advanced manufacturing

How hair gel enables free-form 3D printing with an undo function

Wired, 25JUL2013

LA-based design initiative NSTRMNT has developed Suspended Depositions which makes 3D printing an omni-directional artform that can be paused and undone as and when the maker sees fit. Perhaps the most exciting addition it brings to rapid fabrication, is the free-form element. They have moved the process from a 3-axis machine, where the arm is more constrained in what it can and cannot do, to a 6-axis articulated arm.

Tags: Advanced manufacturing

ADVANCED MATERIALS

Plasmonic Black Metals: Breakthrough in Solar Energy Research?

Science Daily, 30JUL2013

Researchers at the Lawrence Livermore Laboratory have developed a method to improve and control the absorption efficiency and basically turn the metals as black as they want, allowing them to increase, on demand, the absorption of a higher quantity of solar wavelengths. They built nanopillar structures that are trapping and absorbing all the relevant wavelengths of the entire solar spectrum. TECHNICAL ARTICLE

Tags: Advanced materials, Energy, Solar energy

Researchers overcome technical hurdles in quest for inexpensive, durable electronics and solar cells

e! Science News, 30JUL2013

Researchers at the University of Minnesota discovered a novel technology to produce a specialized type of ink from non-toxic nanometer-sized crystals of silicon, often called "electronic ink." This "electronic ink" could produce inexpensive electronic devices with techniques that essentially print it onto inexpensive sheets of plastic. TECHNICAL ARTICLE, VIDEO

Tags: Advanced materials

Water-Enabled Lithography Creates Long Graphene Nanoribbons

IEEE Spectrum, 30JUL2013

A technique developed by researchers at Rice University essentially uses water as the mask in a lithography process that—when followed by ion etching—cuts up graphene into nanoribbons. The process does not require any high-resolution lithography tools—just atmospheric water collected at the edge of a lithography pattern. TECHNICAL ARTICLE

Tags: Advanced materials

Quantum of Sonics: Bonded, Not Stirred

Science Daily, 26JUL2013

Researchers in Canada have discovered a new way to join materials together using ultrasound. They found that if particles were coated with phosphate, they could bond together into strong agglomerates, about the size of grains of sand. A new method could have implications for a range of everyday applications. TECHNICAL ARTICLE

Tags: Advanced materials, S&T Canada

Sub-10 nm nanotechnology engineering breakthrough is big deal for electronics

Nanowerk, 25JUL2013

An international team of researchers (US, Canada, Taiwan, and China) used a technique known as nanopatterning to combine functioning molecular nanoparticles with polymers to build giant surfactants. They are similar to macromolecules, yet they function like molecular surfactants on a nanoscale resulting in nanostructures that guide the size of electronic products.

Tags: Advanced materials

AUTONOMOUS SYSTEMS & ROBOTICS

Video Friday: Insectobots on the Run, Drones Dodge Fireworks, and Robots Dance with Sheets

IEEE Spectrum, 26JUL2013

The biggest robot news of the week seemed to be this 3D printed phone password cracker. As a robot, it's not particularly impressive, but it seems to be at one of those intersections of concepts (robots! hacking! 3D printing!) that makes it irresistible.

Tags: Autonomous systems & robotics

CYBER SECURITY

'Creepy' spy computer turns your real big brother into the NSA

Digital Trends, 30JUL2013

A new breed of DIY mass surveillance comes courtesy of security researcher Brendan O'Connor, who plans to unveil his latest dastardly creation, the Creepy Distributed Object Locator, or CreepyDOL, at the DefCon hacker conference, which kicks off in Las Vegas on August 1.

Tags: Cyber security

continued...

"A science is not mere knowledge, it is knowledge which has undergone a process of intellectual digestion." JOHN HENRY NEWMAN

ENERGY

Best of Both Worlds: Solar Hydrogen Production Breakthrough

Science Daily, 29JUL2013

Using a simple solar cell and a photo anode made of a metal oxide, researchers in Germany have successfully stored nearly five percent of solar energy chemically in the form of hydrogen. This is a major feat as the design of the solar cell is much simpler than that of the high-efficiency triple-junction cells based on amorphous silicon or expensive III-V semiconductors that are traditionally used for this purpose. TECHNICAL ARTICLE

Tags: Energy, S&T Germany, Solar energy

See-Through Solar Film: Researchers Double Efficiency of Novel Solar Cell

Science Daily, 29JUL2013

A new device developed by researchers at UCLA is composed of two thin polymer solar cells that collect sunlight and convert it to power. It's more efficient than previous devices because its two cells absorb more light than single-layer solar devices, it uses light from a wider portion of the solar spectrum, and it incorporates a layer of novel materials between the two cells to reduce energy loss. TECHNICAL ARTICLE

Tags: Energy, Solar energy

ENVIRONMENTAL SCIENCE

Dual radar storm analysis technique works even with one, research says

PhysOrg.com, 30JUL2013

According to researchers at the University of Alabama scientists may be able to better study how supercell thunderstorms work by using the data from just one Doppler radar unit and an analysis technique called synthetic dual-Doppler (SDD) that normally requires two radars. The SDD technique allows researchers to examine the winds inside supercells in three dimensions.

Tags: Environmental science

Radio Waves Carry News of Climate Change: Surprising Tool to Measure Our Changing Climate

Science Daily, 30JUL2013

Researchers in Israel used simple radio antennae on the ground to measure radio waves broadcast by navigational transmitters around the globe, then compared information on the strength of these radio signals with data on temperature fluctuations in the upper atmosphere. They discovered that climate change in the upper atmosphere—caused by an abundance of greenhouse gases—may lead to a greater absorption of radio waves. Weaker signals could therefore be indicative of greater climate change. TECHNICAL ARTICLE

Tags: Environmental science, Climatology

Deciphering the Air-Sea Communication: Ocean Significantly Affects Long-Term Climate Fluctuations

Science Daily, 25JUL2013

Russian scientists analyzed meteorological measurements and sea surface temperatures over the past 130 years. It was found that the ocean significantly affects long term climate fluctuations, while the seemingly chaotic atmosphere is mainly responsible for the shorter-term, year-to-year changes. TECHNICAL ARTICLE

Tags: Environmental science, Climatology

Atmospheric Rivers Set to Increase UK Winter Flooding

Science Daily, 24JUL2013

ARs are narrow regions of intense moisture flows in the lower troposphere of the atmosphere that deliver sustained and heavy rainfall to mid-latitude regions such as the UK. Researchers, from the University of Reading and the University of Iowa found that large parts of the projected changes in AR frequency and intensity would be due to thermodynamic changes in the atmosphere, rather than the natural variability of the climate. TECHNICAL ARTICLE

Tags: Environmental science, Climatology

INFORMATION TECHNOLOGY

Computer scientists develop 'mathematical jigsaw puzzles' to encrypt software

e! Science News, 29JUL2013

Researchers at UCLA have designed a system to encrypt software so that it only allows someone to use a program as intended while preventing any deciphering of the code behind it. Their mathematical obfuscation mechanism can be used to protect intellectual property by preventing the theft of new algorithms and by hiding the vulnerability a software patch is designed to repair when the patch is distributed.

Tags: Information Technology, Mathematics

Why the Internet Needs Cognitive Protocols

IEEE Spectrum, 26JUL2013

Internet of Things is an idyllic concept. But here's the harsh reality: Network operators will always be able to add

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capacity by transmitting data more efficiently and by rolling out more cables and cellular base stations. But this approach is increasingly costly and ultimately unscalable, because the real trouble lies with the technology at the heart of the Internet: its routing architecture.

Tags: Information Technology

A Magnetic Pen for Smartphones Adds Another Level of Conveniences

Science Daily, 24JUL2013

Researchers in Korea developed a magnetically driven pen interface that works both on and around mobile devices. This interface, called the MagPen, can be used for any type of smartphone or tablet computer as long as they have embedded magnetometers.

Tags: Information Technology

Featured Resource

Brightsurf

Current events and breaking news in physical, biological, environmental, space and computer sciences. RSS

MATERIALS SCIENCE

Like water for batteries

e! Science News, 29JUL2013

According to a University of Pittsburgh study it appears that past samples of graphite were likely contaminated by air, causing the samples to appear hydrophobic. The Pitt team has demonstrated—for the first time—these materials are actually intrinsically "hydrophilic." The findings have particular implications for lithium-ion batteries and super capacitors, as both battery types are built from these materials. TECHNICAL ARTICLE

Tags: Materials science, Advanced materials

Gadget Genius: Nanotechnology Breakthrough Is Big Deal for Electronics

Science Daily, 26JUL2013

New materials that function on a nanoscale, which could lead to the creation of lighter laptops, slimmer televisions and crisper smartphone visual displays have been developed by researchers at the University of Akron, using a technique known as nanopatterning to combine functioning molecular nanoparticles with polymers to build these novel materials. TECHNICAL ARTICLE

Tags: Materials science

Behavior of Turbulent Flow of Superfluids Is Opposite That of Ordinary Fluids

Science Daily, 25JUL2013

Physicists at MIT have come up with a method to mathematically describe the behavior of the turbulent flows within superfluids. Their calculations showed that turbulent flows of a class of superfluids on a flat surface behave not like those of ordinary fluids in 2-D, but more like 3-D fluids, which morph from relatively uniform, large structures to smaller and smaller structures. TECHNICAL ARTICLE

Tags: Materials science

MICROELECTRONICS

NRL researchers discover novel material for cooling of electronic devices

e! Science News, 29JUL2013

A team of researchers at the U.S. Naval Research Laboratory and Boston College has identified cubic boron arsenide as a material with an extraordinarily high thermal conductivity and the potential to transfer heat more effectively from electronic devices than diamond.

Tags: Microelectronics

Speed limit set for ultrafast electrical switch

e! Science News, 28JUL2013

Researchers from DOE's SLAC National Accelerator Laboratory have clocked the fastest-possible electrical switching in magnetite, a naturally magnetic mineral. Their results could drive innovations in the tiny transistors that control the flow of electricity across silicon chips, enabling faster, more powerful computing devices.

Tags: Microelectronics, Government S&T

NEUROSCIENCE

How to Learn Successfully Even Under Stress

Science Daily, 30JUL2013

Whenever we have to acquire new knowledge under stress, the brain deploys unconscious rather than conscious learning processes. Researchers in Germany have discovered that this switch from conscious to unconscious learning systems is triggered by the intact function of mineralocorticoid receptors. These receptors are activated by hormones released in response to stress by the adrenal cortex. TECHNICAL ARTICLE

Tags: Neuroscience, S&T Germany

Neuroscientists Plant False Memories in Mice: Location Where Brain Stores Memory Traces, Both False and Authentic, Pinpointed

Science Daily, 25JUL2013

MIT neuroscientists have shown that they can plant false memories in the brains of mice. They also found that many of the neurological traces of these memories are identical in nature to those of authentic memories. TECHNICAL ARTICLE

Tags: Neuroscience

continued...

PHOTONICS

On chip shapeable optical tweezers

Nature Scientific Reports, 26JUL2013

Researchers in France propose an alternative approach where the shape of the optical trap can be tuned by the wavelength in coupled nanobeam cavities. Using these shapeable tweezers, they present micromanipulation of polystyrene microspheres trapped on a silicon chip. These results show that coupled nanobeam cavities are versatile building blocks for optical near-field engineering.

Tags: Photonics, S&T France

QUANTUM SCIENCE

What If Quantum Physics Worked On a Macroscopic Level? Researchers Have Successfully Entangled Optic Fibers Populated by 500 Photons

Science Daily, 25JUL2013

Unlike previous experiments which were carried out with the fiber optics of one photon, researchers in Switzerland created an entanglement between two fiber optics on a microscopic level before moving it to the macroscopic level. The entangled state survived the transition to a larger-scale world and the phenomenon could even be observed with the traditional means of detection, i.e. practically with the naked eye. TECHNICAL ARTICLE

Tags: Quantum science

SCIENCE WITHOUT BORDERS

Experimental Quest to Test Einstein's Speed Limit

Science Daily, 29JUL2013

University of California at Berkeley team's first attempt to test this fundamental tenet of the special theory of relativity demonstrated once again that Einstein was right, but researchers are improving the experiment to push the theory's limits even farther—and perhaps turn up a discrepancy that could help physicists fix holes in today's main theories of the universe. TECHNICAL ARTICLE 1, 2

Tags: Science without borders

Largest Magnetic Fields in the Universe

Science Daily, 26JUL2013

Numerical simulations by scientists in Germany show for the first time the occurrence of an instability in the interior of neutron stars that can lead to gigantic magnetic fields, possibly triggering one of the most dramatic explosions observed in the Universe. TECHNICAL ARTICLE

Tags: Science without borders, S&T Germany

SENSORS

Improving dogs' ability to detect explosives

Alpha Galileo Foundation, 30JUL2013

Researchers in the US and UK are collaborating to explore whether dogs can be trained to recognise the significance of a group of odours, rather than having to learn each scent individually. It's getting the dogs to quickly understand the relevance of certain new substances without alerting on every household chemical.

Tags: Sensors

Tetrapod quantum dots light the way to stronger polymers

Nanowerk, 29JUL2013

Researchers at Lawrence Berkeley National Laboratory have developed an advanced opto-mechanical sensing technique based on tetrapod quantum dots (tQD) that allows precise measurement of the tensile strength of polymer fibers with minimal impact on the fiber's mechanical properties. tQD probes should prove valuable for a variety of biological, imaging and materials engineering applications. TECHNICAL ARTICLE

Tags: Sensors, Government S&T

Physicists Detect Radio Waves With Light

MIT Technology Review, 22JUL2013

Researchers in Denmark demonstrate a device that detects ultra-weak radio waves in an entirely new way. Their new box of tricks converts radio waves into light signals, which can then be transmitted and analysed using standard optical tools. TECHNICAL ARTICLE

Tags: Sensors ■

*RFI ANNOUNCEMENT

TW-HS Enduring Capability

Solicitation Number: RFI-HQ0034-TW-HS-2013

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