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S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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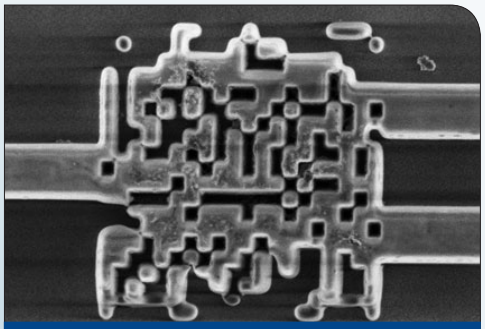
FEATURE ARTICLES

Computing at the speed of light

Nanowerk, 19MAY2015

Researchers at the University of Utah have developed an ultracompact beamsplitter for dividing light waves into two separate channels of information. The device brings researchers closer to producing silicon photonic chips that compute and shuttle data with light instead of electrons. TECHNICAL ARTICLE



The overhead view of a new beamsplitter for silicon photonics chips that is the size of one-fiftieth the width of a human hair. Image: Dan Hixson/University of Utah College of Engineering

Tags: Microelectronics, Photonics, Featured Article

Towards a tunable graphene-like two-dimensional material

Science Daily, 15MAY2015

A team of researchers in the US (MIT, Harvard University) has demonstrated that combining an organic molecule, 2,3,6,7,10,11-hexaiminotriphenylene (HITP), with nickel ions in aqueous ammonia solution and air causes the self-assembly of a highly conductive porous black powder, $Ni_3(HITP)_2$. It is composed of stacks of infinite two-dimensional sheets resembling graphite. The new porous material exhibits high electrical conductivity as a bulk material that is potentially tunable and has unusual temperature dependence, suggesting new fundamental physics. TECHNICAL ARTICLE

Tags: Advanced materials, Featured Article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

Intense Lasers Cook Up Complex, Self-Assembled Nanomaterials

Newswise, 14MAY2015

Researchers at the Brookhaven National Laboratory have developed a technique called Laser Zone Annealing (LZA). It sweeps a focused laser-line across a sample to generate intense and instantaneous spikes in temperature and drives self-assembly of nanomaterials at rates more than 1,000 times faster than traditional industrial ovens. The laser can be used to "draw" structures across the surface to assemble nanostructures in well-defined patterns. TECHNICAL ARTICLE

Tags: Advanced manufacturing, Government S&T

ADVANCED MATERIALS

Fuel cells: Bringing order to defects and making way for oxygen to move

Science Daily, 18MAY2015

Researchers at the Pacific Northwest National Laboratory have discovered a new non-stoichiometric metal oxide $SrCrO_{2.8}$ which contains ordered arrays of SrO_2 planes interleaved between layers of tetrahedrally coordinated Cr^{+4} ions and separated by ~1nm. When mildly heated in air, it reversibly transforms from a semiconducting form with rhombohedral structure to a metallic form with a cubic perovskite structure. TECHNICAL ARTICLE

Tags: Advanced materials, Government S&T

Scientists print low cost radio frequency antenna with graphene ink

Nanowerk, 16MAY2015

With industry partners, researchers in the UK have printed a radio frequency antenna using compressed graphene ink. The antenna performed well enough to make it practical for use in RFID tags and wireless sensors. The antenna is flexible, environmentally friendly and could be cheaply mass-produced. TECHNICAL ARTICLE

Tags: Advanced materials, S&T UK, Sensors

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Highly conducive material for 3D-printing of circuits

Science Daily, 14MAY2015

Researchers in Singapore have invented a new type of thermoplastic thread that can be used in 3D printers to create functional circuits for use in electrical gadgets. Its resistivity is in the range of 0.5-1.0 Wcm. Researchers have successfully used this new material to print prototypes such as a USB connector that can light up a LED bulb, complex three-dimensional circuits, and a wearable flexible sensor.

Tags: Advanced materials, Advanced manufacturing

'Supercool' material glows when you write on it

Science Daily, 13MAY2015

Researchers at the University of Michigan found that by varying the lengths of the side chains of a family of organic molecules, they could cause the molecule to remain a liquid even when cooled below its melting temperature of 273 degrees Fahrenheit. Even living cells sitting on a film of the supercooled liquid produce crystal footprints, which means that it is about a million times more sensitive than other known molecules that change color in response to pressure. Its unusual properties may guide the development of electronics, medicines and sensors. TECHNICAL ARTICLE

Tags: Advanced materials

AUTONOMOUS SYSTEMS & ROBOTICS

Video Friday: New Quadruped, Drone UFO, and Bricklaying Robot

IEEE Spectrum, 15MAY2015

Curiosity has been on the what is literally the longest road trip ever, and here's an update on the mission from JPL.

Tags: Autonomous systems & robotics

COMMUNICATIONS TECHNOLOGY

New technology could fundamentally change future wireless communications

PhysOrg.com, 19MAY2015

Researchers in the UK have developed a new technique that can estimate and cancel out the interference from one's own transmission, allowing a radio device to transmit and receive on the same channel at the same time. This therefore requires only one channel for two-way communication, using half as much spectrum compared to the current technology. TECHNICAL ARTICLE 1, 2

Tags: Communications Technology, S&T UK

Nanosatellites could provide future battlefield communications

Defense Systems, 15MAY2015

Space and Missile Defense Command (SMDC) has developed and tested a nanosatellite that provides voice and data, called the SMCD-ONE (Orbital Nanosatellite Effect), and is developing an imaging satellite that would work the same way. The first SMDC-ONE is in orbit now, and the tech center is planning to launch three more this year, with an as-yet undetermined number to be launched in 2016.

Tags: Communications Technology

Gold 'necklaces' add sparkle to information processing

Science Daily, 14MAY2015

An international team of researchers (Singapore, UK) devised a way to propagate surface plasmons over long chains of gold nanoparticles. This allowed them to miniaturize the transport of highly confined light over distances that are long enough to be useful for optical circuits. In the future, the team hopes to produce designer networks using their nanoparticles. TECHNICAL ARTICLE

Tags: Communications Technology

CYBER SECURITY

More than 1,000 Organizations Join IBM to Battle Cybercrime

IBM News, 14MAY2015

IBM's new cloud-based cyberthreat network, X-Force Exchange, is designed to foster broader industry collaboration by sharing actionable data to defend against these very real threats to businesses and governments. The company provided free access to its 700 terabyte threat database which includes two decades of malicious cyber-attack data from IBM, as well as anonymous threat data from thousands of organizations.

Tags: Cyber security

Navy unveils new 5-year cyber strategy plan reflecting rising tide of cybersecurity threats

Fierce Government IT, 11MAY2015

Within the plan, there are five strategic goals with even more specific outcomes that must be achieved within the next 18 months: Operate the network as a warfighting platform, Conduct tailored signals intelligence, Deliver warfighting effects through cyberspace, Create shared cyber situational awareness, and Establish and mature the Navy's Cyber Mission Force.

Tags: Cyber security, S&T Policy

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"Science can amuse and fascinate us all, but it is engineering that changes the world."

ANONYMOUS

ENERGY

Spanish researchers are developing bladeless wind turbines

Science Daily, 18MAY2015

The bladeless wind turbine technology, developed by researchers in Spain, captures kinetic energy and converts it to electricity by using a phenomenon known as vorticity, which produces a series of spinning vortices in the surrounding air. They designed the 2.7-metre-high 'cones' specifically so that these vortices would accumulate simultaneously all the way up their length.

Tags: Energy

China developing fast reactors that will be cheaper than coal

Next Big Future, 16MAY2015

China will develop its own commercial scale fast reactor in 2023 with a more advanced version in 2030. They will then scale up production as part of a build up to around 400 gigawatts of nuclear power by 2050. This would be four times more than the nuclear power currently in the USA.

Tags: Energy, S&T China

ENVIRONMENTAL SCIENCE

Scientists show 'breaking waves' perturb Earth's magnetic field

Science Daily, 11MAY2015

Researchers at the University of New Hampshire report that underlying physical process that creates striking "breaking wave" cloud patterns in our atmosphere also frequently opens the gates to high-energy solar wind plasma that perturbs Earth's magnetic field, or magnetosphere, which protects us from cosmic radiation. The changing energy levels can have impacts on how the radiation belts either protect or threaten spacecraft and Earth-based technologies. TECHNICAL ARTICLE

Tags: Environmental science, Climatology

Watch invisible gravity waves rumble through the atmosphere

Science Daily, 11MAY2015

Gravity waves ripple toward space from disturbances in the lower atmosphere. Sometimes they can affect the reliability of Earth-based communication systems. Researchers at NCAR pushed their Whole Atmosphere Community Climate Model to a resolution that is fine enough to pick up gravity waves at their source, when they're still relatively small. Modeling capability helps better understanding of space weather. TECHNICAL ARTICLE

Tags: Environmental science, Government S&T

IMAGING TECHNOLOGY

Japanese scientists have invented a new trillion-frame-per-second camera

Science Alert, 13MAY2015

Researchers in Japan have developed a camera which works by splitting a single light pulse into a fast barrage of rainbow-coloured smaller pulses. Each separate colour flash can be analysed to string together a moving picture of what the object looked like over the time it took the dispersed light pulse to travel through the device. The camera has applications in laser ignition of fusion and phase transition of materials.

Tags: Imaging technology, S&T Japan

MATERIALS SCIENCE

Random nanowire configurations increase conductivity over heavily ordered configurations

PhysOrg.com, 15MAY2015

Researchers at Lehigh University have identified that a performance gain in the electrical conductivity of random metal nanowire networks can be achieved by slightly restricting nanowire orientation. Heavily ordered configurations do not outperform configurations with some degree of randomness; randomness in the case of metal nanowire orientations acts to increase conductivity. TECHNICAL ARTICLE

Tags: Materials science

Making Superconductors Sturdier

American Physical Society Spotlight, 31MAR2015

Researchers in the UK propose that exciting superconductors with pulses of terahertz radiation could allow them to be transiently cooled (much like the laser cooling of atoms), reducing the impact of thermal noise. TECHNICAL ARTICLE

Tags: Materials science, S&T UK

MEDICAL SCIENCES

Exploring a new frontier of cyber-physical systems: The human body

Nanowerk, 15MAY2015

NSF has announced two, five-year, center-scale awards totaling $8.75 million to advance the state-of-the-art in

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medical and cyber-physical systems (CPS). One project will develop "Cyberheart"—a platform for virtual, patient-specific human heart models and associated device therapies. The other project will combine teams of micro-robots with synthetic cells to perform functions that may one day lead to tissue and organ re-generation.
Tags: Medical Sciences, Biotechnology, S&T Policy

Featured Resource

COSIS.net

COSIS.net is an online community for scientists and their affiliated organizations for the exchange of information and the discussion of ideas and results. Membership is open to researchers affiliated with an organization.

MICROELECTRONICS

A high-performance microbattery that can be built into chips

KurzweilAI, 13MAY2015

Researchers at the University of Illinois Urbana-Champaign used 3D holographic lithography and 2D photolithography to create well-defined, periodically structured porous electrodes, allowing for fast movement of electrons and ions inside the battery for high energy and high power density. TECHNICAL ARTICLE
Tags: Microelectronics, Energy

Optical-chips team sweeps Clean Energy Prize

MIT News, 13MAY2015

Researchers at MIT have developed a way to integrate fiber optics into computer chips, replacing copper wires that rely on electricity. Using light instead of electricity can drop energy usage by about 95 percent in chip-to-chip communications and increase bandwidth tenfold.
Tags: Microelectronics, Advanced materials, Energy

Silicon photonics technology ready to speed up cloud and big data applications

PhysOrg.com, 13MAY2015

IBM engineers have designed and tested a fully integrated wavelength multiplexed silicon photonics chip, which will soon enable manufacturing of 100 Gb/s optical trans-ceivers. This will allow datacenters to offer greater data rates and bandwidth for cloud computing and Big Data applications.
Tags: Microelectronics

Zooming in on Failures

American Physical Society Spotlight, 06MAY2015

According to semiconductor industry requirements, a resolution of 100 nm is necessary for characterizing state-of-the-art flash memories and next-generation circuits. Rayleigh resolution limit of near-infrared light is several times too large to detect 100-nm features. A team of researchers in Singapore overcame this limitation by illuminating the defects using near-infrared light shone through a spherical silicon lens. TECHNICAL ARTICLE
Tags: Microelectronics

An Inside View of Magnetic Skyrmions

American Physical Society Spotlight, 01MAY2015

Using high spatial resolution technique, researchers in Germany have imaged the internal structure of magnetic skyrmions in a metal film and confirmed that both the size and shape of the skyrmions are consistent with theory. TECHNICAL ARTICLE
Tags: Microelectronics, S&T Germany

PHOTONICS

Swirling light beams carve intricate patterns

Nanotechweb, 15MAY2015

Researchers in the UK used beams of light polarized into spirals to create intricate patterns on the surface of metals. This is the first time that these "logarithmic spirals" have been produced in the lab. The researchers believe that they could provide valuable insights into the angular momentum of light. They could also be used in imaging and data-storage applications. TECHNICAL ARTICLE
Tags: Photonics, S&T UK

QUANTUM SCIENCE

Quantum physics on tap: Nano-sized faucet offers experimental support for longstanding quantum theory

PhysOrg.com, 15MAY2015

An international team of researchers (Canada, USA, Germany) report that the flow of superfluid helium through miniature channel, less than 30 atoms wide does, indeed, appear to slow down. Insights from the research could someday contribute to novel technologies, such as nano-sensors with applications in GPS systems. TECHNICAL ARTICLE
Tags: Quantum science

UK's first superconducting quantum bit foundry

PhysOrg.com, 13MAY2015

In the device developed by researchers in the UK, several qubits are coupled to a microwave transmission line. The images show various aspects of the quantum nature of the device and, importantly, detailed analysis of the data prove the high quality of the design and fabrication process. Potential applications of the new technology include quantum computing, medicine and space exploration.
Tags: Quantum science, S&T UK

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Superconducting metamaterials and qubits

arXiv, 05MAY2015

Researchers at Syracuse University report on the fabrication and low-temperature measurement of metamaterial transmission-line resonators patterned from Al thin films and describe multiple approaches for numerical simulations of the microwave properties of these structures, along with comparisons with the measured transmission spectra. The ability to predict the mode spectrum based on the chip layout provides a path towards future designs integrating metamaterial resonators with superconducting qubits.

Tags: Quantum science

S&T POLICY

How cooperative research is shaping the future internet

PhysOrg.com, 13MAY2015

EU sponsored FELIX (Federated Test-Beds for Large-Scale Infrastructure Experiments) aims to give future internet researchers in the EU and Japan the means to demonstrate new network technologies on a world-scale test-bed. The project team is now working on creating an easily accessible experimental framework to satisfy the needs of both European and Japanese research communities, and to enable greater collaboration.

Tags: S&T policy, S&T EU

SENSORS

Using electrochemistry, researchers create reconfigurable, voltage-controlled liquid metal antenna

PhysOrg.com, 19MAY2015

Researchers at North Carolina State University used electrochemical reactions to shorten and elongate a filament of liquid metal and changed the antenna's operating frequency. By placing an electrical potential across the interface between the liquid metal and an electrolyte, they found that they could cause the liquid metal to spread by applying a positive voltage—or to contract by applying a negative voltage. The antenna prototype can tune over a range of at least two times greater than systems using electronic switches.

TECHNICAL ARTICLE

Tags: Sensors

New test detects drug use from a single fingerprint

Science Daily, 15MAY2015

When someone has taken cocaine, they excrete traces of benzoylecgonine and methylecgonine as they metabolise the drug. Using Desorption Electrospray Ionisation (DESI), an international team of researchers (UK, the Netherlands) were able to determine if these substances were present in fingerprint residue. TECHNICAL ARTICLE

Tags: Sensors

Researchers build new fermion microscope

MIT News, 13MAY2015

A microscope built by researchers at MIT uses a laser-based technique to trap and freeze fermions in place, and images up to 1,000 individual fermionic atoms simultaneously. Electrons and nuclear matter are difficult to understand theoretically, so researchers are trying to use ultracold gases of fermionic atoms as stand-ins for other fermions.

TECHNICAL ARTICLE

Tags: Sensors, Particle physics ■

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