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S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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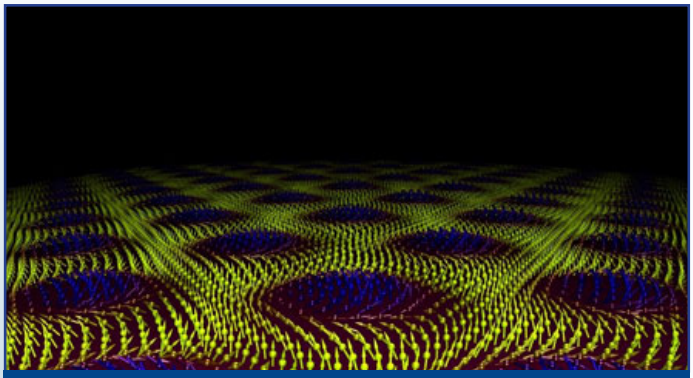

Magnetic eddies in silicon manganese form a regular grid

New physical phenomenon could drastically reduce energy consumption by computers

Nanowerk, 21FEB2012

A team of researchers at TUM (Germany) discovered an entirely new magnetic structure in a silicon manganese crystal—a grid of magnetic eddies, called skyrmions. At present a current is used in the read/write head of a hard drive to generate a magnetic field in order to magnetize a spot on the hard drive and thus write a data bit. Skyrmions, in contrast, can be moved directly—and with very small currents. They managed to build a data bit out of only 15 atoms. By way of comparison, a magnetic bit on a common hard drive requires about one million atoms. TECHNICAL ARTICLE: T. Schulz, et.al., Emergent electrodynamics of skyrmions in a chiral magnet from arxiv.org

Tags: Information Technology, Featured article

Single-atom transistor is end of Moore's Law; may be beginning of quantum computing

Science Daily, 19FEB2012

The smallest transistor ever built—in fact, the smallest transistor that can be built—has been created using a single phosphorus atom by an international team of researchers at the University of New South Wales, Purdue University and the University of Melbourne. TECHNICAL ARTICLE: Martin Fuechsle, et.al., A single-atom transistor, Nature Nanotechnology (2012) doi:10.1038/nnano.2012.21

Tags: Microelectronics, Quantum science, Featured article

Virtual ghost imaging: New technique enables imaging even through highly adverse conditions

EurekAlert, 15FEB2012

Ghost imaging (GI), and its even more oddly named cousin virtual ghost imaging (VGI), seem to contradict conventional wisdom by being able to image an object by simply counting photons in a "light bucket." This non-intuitive technique, however, can lead to better images when conditions are less than ideal. In a first-of-its-kind demonstration, a team of researchers from the U.S. Army Research Laboratory in Adelphi, Md., and the University of Maryland in Baltimore, captured reflected photons from a highly specialized laser beam to create a VGI image of a remote target. The trick to making an image from photons that contain no spatial information lies in physics related to "entanglement."

Tags: Imaging technology, Government S&T, Quantum science, Featured article

S&T News Articles

ADVANCED MATERIALS

Nanodust: An explosive problem

R&D Magazine, 17FEB2012

Much like wheat flour and cornstarch, the industrial-scale processing of nanomaterials creates a type of dust that can combust with little energy. In fact, a recent study shows that only 1/30th of the energy that caused a deadly 2008

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sugar dust explosion in Georgia would be needed to ignite typical nanomaterials, such as aluminum. TECHNICAL ARTICLE: S. Morgan Worsfold, et.al. Review of the Explosibility of Nontraditional Dusts, Industrial and Engineering Chemistry Research, dx.doi.org/10.1021/ie201614b

Tags: Advanced materials, Nanomaterials

AUTONOMOUS SYSTEMS & ROBOTICS

Truss-Climbing Robot Can Build Structures, Take Them Apart

IEEE Spectrum, 21FEB2012

Like other climbing bots we've seen before, Cornell University's "autonomous truss-structure modifying robot" is capable of clambering around three-dimensional structures, but with a twist: The robot can add and remove bits and pieces as it goes. VIDEO

Tags: Autonomous systems & robotics, Robotics

BIOTECHNOLOGY

Inspired by Gecko Feet, Scientists Invent New Adhesive

Newswise, 16FEB2012

Biologists have long been amazed by gecko feet, which allow 5-ounce lizards to produce an adhesive force equivalent to carrying 9 lbs. up a wall without slipping. Now, a team of polymer scientists and a biologist (at U. Mass. Amherst) have invented "Geckskin," an adhesive device that can hold 700 pounds on a smooth wall.

Tags: Biotechnology, Biomimetics

CYBER SECURITY

Nash's beautiful mind pre-empted million-dollar puzzle

New Scientist, 21FEB2012

In recently declassified letters, Nobel laureate John Nash penned ideas about cryptography and computational complexity decades before their time. The revelations come in recently declassified handwritten letters exchanged between the US National Security Agency and Nash in 1955. Nash's letters detail an encryption technique based on the difficulty of computing certain mathematical functions—an idea that underlies modern cryptography, but was not developed publicly until the mid-1970s.

Tags: Cyber security, Cryptology, Mathematics

Cryptographers Discover Public Key Infrastructure Flaw

Information Week, 15FEB2012

A team of European and American mathematicians and cryptographers, led by Dutch mathematician Arjen K. Lenstra discovered that public key encryption using the widely used RSA 1,024-bit algorithm is only 99.8% secure, at best, meaning that at least two out of every 1,000 public keys can be easily cracked. The finding comes from a paper due to be presented at the Crypto 2012 conference in August in Santa Barbara, Calif. The researchers published their paper early, given the severity of the vulnerabilities they discovered. TECHNICAL PAPER: Ron was wrong, Whit is right

Tags: Cyber security, Information technology

ENERGY

New Nanotechnology Converts Heat into Power When It's Needed Most

Newswise, 22FEB2012

Never get stranded with a dead cell phone again. A promising new technology called Power Felt, a thermoelectric device that converts body heat into an electrical current, soon could create enough juice to make another call simply by touching it. Developed by researchers in the Center for Nanotechnology and Molecular Materials at Wake Forest University, Power Felt is comprised of tiny carbon nanotubes locked up in flexible plastic fibers and made to feel like fabric. The technology uses temperature differences—room temperature versus body temperature, for instance—to create a charge.

Tags: Energy, Information technology, Nanomaterials

Wringing more energy out of everyday motions

EurekAlert, 21FEB2012

Randomness and chaos in nature, as it turns out, can be a good thing—especially if you are trying to harvest energy from the movements of everyday activities like walking. The researchers used magnets to simulate nonlinearity in a cantilever model made of a piezoelectric material, which has a unique property of releasing energy every time it is bent. By changing the orientation of the magnet, the researchers were able to "tune" the bending of the arm, and thus the production of electricity, over a broader spectrum of frequencies.

Tags: Energy, Alternate energy

Scientific American Ranks Energy Storage Technologies

IEEE Spectrum, 17FEB2012

The magazine assembled a panel of experts and had them rank the five in terms of scalability, cost effectiveness, and energy efficiency. On a scale of 5, pumped hydro and compressed air get scores of 4 or close to 4, while three others--advanced batteries, thermal storage, and home hydrogen are deemed to "require some kind of breakthrough." ARTICLE: Massive Energy Storage Technologies Could Revitalize the Power Grid, Scientific American, March 2012.

Tags: Energy

continued...

"The technologies which have had the most profound effects on human life are usually simple." FREEMAN DYSON

Frontline Military Technology Promises Battery Revolution

BAE Systems, 13FEB2012

BAE Systems developed the patented technology to lighten the load of soldiers carrying rucksacks, which can weigh up to 76kg and be filled with numerous electrical items. The structural batteries store the electrical energy within the physical structure of a device and thus helping to reduce or eliminate the need for traditional batteries, which create weight and bulk, as well as the burden and cost of carrying spares.

Tags: Energy, Battery

ENVIRONMENTAL SCIENCE

The space junk cleaning device

BBC, 16FEB2012

Switzerland is well known for being a tidy nation, but now Swiss scientists are using this national instinct to help design a special satellite to scoop up space junk orbiting Earth. Nasa says more than half a million pieces of spent rocket parts, broken satellites and other pieces of debris are orbiting Earth and some satellites have been damaged or destroyed after colliding with space junk. VIDEO

Tags: Environmental science, S&T Switzerland

FORECASTING

Important Emerging Technologies for the 21st Century

EurekAlert, 14FEB2012

The World Economic Forum's Global Agenda Council on Emerging Technologies has just released its list of Important Technologies that will change the world in the years ahead. The list highlights technology trends most likely to impact the state of the world in the near future and was developed by a cross section of experts from science, businesses, and public policy. In addition to nanomaterials and synthetic biology, the list also includes wireless power, high energy-density power systems, personalized medicine and nutrition, and enhanced education technologies.

Tags: Forecasting, Emerging technology

GOVERNMENT S&T

Rapid response: ONR technologies are building the future force

EurekAlert, 21FEB2012

Three systems developed by ONR through its TechSolutions process are being featured in a new video. TechSolutions, ONR's rapid-response science and technology program, focuses on developing prototype technologies to solve problems submitted by warfighters within 12-18 months from the original request.

Tags: Government S&T, Military technology, ONR

INFORMATION TECHNOLOGY

Smaller antennas for smaller wireless devices and still smaller micro-air vehicles

Next Big Future, 21FEB2012

Researchers at the University of Michigan have designed an antenna the size of a quarter. The key to this new design is the hemispherical shape of the antenna which takes advantage of volume—just imagine the top half of a sphere with a descending spiral antenna winding down to the base—instant miniaturization. This is significant because in most cases the size of the antenna within a wireless device is actually the limiting factor in the minimum achievable size of the device itself.

Tags: Information Technology

MICROELECTRONICS

Microchips' optical future

PhysOrg.com, 15FEB2012

Computer chips are one area where the United States still enjoys a significant manufacturing lead over the rest of the world. In order to maintain its manufacturing edge, the United States will need to continue developing new technologies at a torrid pace. And one of those new technologies will almost certainly be an integrated optoelectronic chip. According to researchers from Carnegie Mellon and MIT the most intuitive way to add optics to a microprocessor's electronics would be to build both directly on the same piece of silicon, a technique known as monolithic integration. Monolithically integrated chips were actually cheaper to produce in the United States than in low-wage countries.

Tags: Microelectronics

NEUROSCIENCE

Prune bad brain wiring with magnetic pulses

KurezweilAI, 21FEB2012

In transcranial magnetic stimulation (TMS), a magnetic coil induces electric currents in the brain that can strengthen or suppress neural connections. Researchers in Australia have found that stimulating the brain at intensities lower than would make a neuron fire can remove unwanted neural connections in mice.

Tags: Neuroscience

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QUANTUM SCIENCE

Traffic planning in the quantum world

Nanowerk, 21FEB2012

Researchers in France and Belgium have applied the concept of the Braess paradox to the quantum world. By combining quantum simulations of a model system and scanning-probe experiments, they have shown that an analogue of the Braess paradox can occur in mesoscopic semiconductor networks by an increase of the conductance network when one arm in the network is partially blocked in a controlled manner. In other words, electrons in such nano-networks can behave like car drivers in congested cities.

Tags: Quantum science

Featured Resource

Science News

Biweekly news magazine covers important and emerging research in all fields of science. It publishes concise, accurate, timely articles that appeal to both general readers and scientists.

RSS

S&T POLICY

Citizen science goes 'extreme'

Nature News, 17FEB2012

Although researchers have been calling on amateurs and enthusiasts for decades to aid in collecting and processing large volumes of data, the latest approaches aim to enlist the public in helping to shape research questions. But should science be a platform for community activism? In its 'extremes', the emerging approach may extend beyond the bounds of formal science, presenting challenges for assuring data quality and unbiased investigations.

Tags: S&T policy, Science without borders

DFG to establish 4 new research units

EurekAlert, 16FEB2012

As with all DFG (German Research Foundation) Research Units, the new groups will collaborate across locations and disciplines. Their main topics are computer-aided knowledge representation, the structure and dynamics of ecological networks, new statistical procedures, and nano innovations for optoelectronics. During the initial three-year funding period, the new Research Units will receive approximately 6.8 million euros. The DFG now funds a total of 199 Research Units.

Tags: S&T policy, Foreign S&T, S&T Germany

SCIENCE WITHOUT BORDERS

How quickly things spread

PhysOrg.com, 21FEB2012

Scientists at the University of Cambridge have taken the understanding of standard graph theory one step further by designing a model that can plot the effects of mobility and interaction with the use of a time-ordered graph. The time-ordered graph reduces the complexity of a dynamic network and applies it to a static network by using directed flows. Directed flows allow for network properties to be extended; such as betweenness, which measures the influence a node has over the spread of information through the network.

Tags: Science without borders, Mathematics

Paper electronics is successful: Where next?

Nanowerk, 21FEB2012

Photovoltaic panels made from paper rather than wood or cotton could become a cheap, easy alternative to traditional solar cells. Electronics and electrics on or in paper is being used for security, safety, crime prevention, brand enhancement and merchandising. Cost, weight or bulk are a problem, so conventional electronics in paper products is being replaced with printed electronics.

Tags: Science without borders

Wild flower blooms again after 30,000 years on ice

Nature News, 21FEB2012

The mammoth steppe, vanished about 13,000 years ago. It has no modern counterpart. Yet one of its plants has reportedly been resurrected by a team of scientists who tapped a treasure trove of fruits and seeds, buried some 30,000 years ago by ground squirrels and preserved in the permafrost.

Tags: Science without borders

Scattered light could reveal alien atmospheres

PhysOrg.com, 20FEB2012

Once per orbit exoplanets go in front of (transit) their host stars from our point of view, and the light from these stars passes through the atmospheres of these planets on its way to Earth. The molecules in these alien atmospheres absorb some of this starlight. Spectra allow scientists to identify the atmosphere.

Tags: Science without borders

The fate of a thin liquid filament (w/ video)

PhysOrg.com, 20FEB2012

Scientists from the University of Cambridge have developed a method for predicting whether a filament of fluid will condense along its length into a single droplet, or collapse into multiple droplets. The research could aid in designing processes for paint-spraying, ink-jet printing and the dispersion of drugs for inhalation.

Tags: Science without borders, Information technology

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Technical details of the China Broad Group Factory Mass Produced 30-story building that was assembled in 15 days

Next Big Future, 17FEB2012

Six months ago, China's Broad Group had a scale model of their 30-story building earthquake-certified. At the end of 2011, they built the actual 30-story building in 15 days. Technical details

Tags: Science without borders, China

Mapping out the future of GPS technology

EurekAlert, 16FEB2012

Ditching satellites and complex, powerful computers and opting for camera technology inspired by small mammals may be the future of navigation systems. The world-first approach to visual navigation algorithms, which has been dubbed SeqSLAM (Sequence Simultaneous Localisation and Mapping), uses local best match and sequence recognition components to lock in locations. SeqSLAM uses the assumption that you are already in a specific location and tests that assumption over and over again.

Tags: Science without borders, Biometrics

Physicists Predict The Existence of Time Crystals

MIT Technology Review, 16FEB2012

If crystals exist in spatial dimensions, then they ought to exist in the dimension of time too, says Nobel prize-winning physicist Frank Wilczek. One of the most powerful ideas in modern physics is that the Universe is governed by symmetry, the idea that certain properties of a system do not change when it undergoes a transformation of some kind.

Tags: Science without borders

US launches new coalition to fight climate change

PhysOrg.com, 16FEB2012

Faulting the world for not doing enough to fight climate change, the United States [on Thursday, Feb 16] announced the formation of a coalition to cut short-lived pollutants that speed up warming and harm health. The coalition of the United States, Bangladesh, Canada, Mexico, Sweden and Ghana will launch a global drive to curb black carbon (soot), methane and hydrofluorocarbons (HFCs).

Tags: Science without borders, Climatology

SENSORS

Computer scientist developing intersections of the future with fully autonomous vehicles (w/Video)

PhysOrg.com, 18FEB2012

Researchers at UT Austin focus on creating AI computing systems needed to make autonomous driving a reality. In their newest system, AI driver agents (the autonomous vehicles) "call ahead" and reserve space and a time at an intersection. Then an arbiter agent, called an "intersection manager," approves the request, and the vehicles move through.

Tags: Sensors, Autonomous Systems & Robotics

DOD Targets Enhanced Long-Range 3-D Imaging Technology

Information Week, 17FEB2012

Through the Military Imaging and Surveillance Technology-Long Range (MIST-LR) program, DARPA will develop new electro-optic sensing capabilities for both airborne and ground military vehicles that focus on long-range geometric and 3-D imaging. The new technology will be based on a number of imaging techniques, including computational imaging, synthetic-aperture imaging, digital holography, multi-static laser radar, and angle-resolved imaging based on light transport analysis. Solicitation: DARPA-SN-12-29

Tags: Sensors, DARPA, Government S&T

TI's contact-less temperature sensor opens up possibilities

ZDnet, 16FEB2012

First-ever single-chip passive infrared temperature sensor could be used in tablets, handsets, watches, and cameras for applications yet to be imagined. The 1.6 mm x 1.6 mm square dot packs a MEMS thermopile sensor, signal conditioning, 16-bit analogue-to-digital converter (ADC), local temperature sensor, and voltage references all into a package than can be integrated into a silicon manufacturing process. The chip operates from -40 to +125^{0}C, with typical accuracy of ±1^{0}C for the passive IR sensor and ±0.5^{0}C for the local temperature sensor.

Tags: Sensors

Elbit Systems Introduce a Hyperspectral Sensor Payload for UAVs

Defense News, 14FEB2012

Hyperspectral sensing opens new capabilities for intelligence collection, particularly in the identification of specific materials, coverage of large areas and spotting concealed or underground activity by tracking the presence of specific signatures resulting from known activities (including heat, chemical residues etc.) The airborne segment of the hyperspectral sensor is responsible of collecting the signals, transferring them via datalink to the ground segment, where automatic interpretation of the images and data extraction is produced.

Tags: Sensors, Military technology

New nano-material combinations produce leap in infrared technology

EurekAlert, 14FEB2012

Researchers in Arizona State University are using a combination of indium arsenide and indium arsenide antimonide to build the superlattice structures. The combination

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allows devices to generate photo electrons necessary to provide infrared signal detection and imaging. The unique property of the superlattices is that their detection wavelengths can be broadly tuned by changing the design and composition of the layered structures.

Tags: Sensors, Nanomaterials, Photonics

STEM

America's Path to One Million More Science and Engineering Grads

IEEE Spectrum, 16FEB2012

President's Council of Advisors on Science and Technology recommends steps to combat some major reasons students give for switching out of STEM. Two of these are: uninspiring introductory courses, and difficulty with math in introductory courses. The Council recommendations include establishing programs to train faculty in better teaching methods, expanding the use of research and engineering design courses in the first two years, launching "a national experiment in mathematics undergraduate education." Council's report: Engage to Excel

Tags: STEM, S&T Policy ■

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