Volume 2, Issue 34 ■ 24AUG2012

S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

Feature Articles

First Atomtronic Radio Broadcasts Matter Waves

MIT Technology Review, 20AUG2012

Researchers at the University of Colorado and NIST have built a version of a kind of circuit that works with atoms rather than electrons. Their atomtronic circuit generates an oscillating atom current that emits matter waves in which atoms carry energy through space. The heart of their device is an atomtronic transistor—an optomagnetic trap with three compartments that can hold a Bose Einstein Condensate of rubidium atoms cooled almost to absolute zero.

Tags: Breakthrough technology, Government S&T, Featured Article

Microwave laser fulfills 60 years of promise

Nature News, 20AUG2012

Using spare chemicals, a laser bought on eBay and angst from a late-night argument, physicists in the UK have got the world's first room-temperature microwave laser working. The achievement comes nearly 60 years after the first clunky versions of such devices were built, and could revolutionize communication and space exploration. TECHNICAL ARTICLE

Tags: Breakthrough technology, Featured Article

The room-temperature maser relies on a crystal of organic molecules excited with an optical laser. NPL

Writing the book in DNA: Geneticist encodes his book in life's language

Science Daily, 20AUG2012

Using next-generation sequencing technology and a novel strategy to encode 1,000 times the largest data size previously achieved in DNA, a Harvard geneticist encodes his book in life's language. The researchers used binary code to preserve the text, images and formatting of the book. While the scale is roughly what a 5 ¼-inch floppy disk once held, the density of the bits is nearly off the charts: 5.5 petabits, or 1 million gigabits, per cubic millimeter. TECHNICAL ARTICLE

Tags: Breakthrough technology, Featured Article

S&T News Articles

ADVANCED MANUFACTURING

New U.S. Institute Hopes to Put Its Stamp on Additive Manufacturing

Science Insider, 20AUG2012

Often called 3D printing, additive manufacturing uses a combination of new technologies to make things by applying many thin layers. The institute is the first tangible evidence of the Administration's plans, announced in March, to invest $1 billion on 15 institutes that would serve as regional centers of excellence across all sectors of manufacturing. Last month the President's Council of Advisors on Science and Technology strongly endorsed the concept in a report on how the country could regain its edge in advanced manufacturing.

Tags: Advanced manufacturing

BACK TO TOP

ADVANCED MATERIALS

New Space-Age Insulating Material for Homes, Clothing and Other Everyday Uses

Newswise, 19AUG2012

New aerogels developed at the Lawrence Livermore Laboratory are up to 500 times stronger than their silica counterparts. A thick piece actually can support the weight of a car. And they can be produced in a thin form, a film so flexible that a wide variety of commercial and industrial uses are possible. NASA envisions one use in an advanced re-entry system.

Tags: Advanced materials, Government S&T

Revealing the truth about 'trapped rainbow' storage of light in metamaterials

Nature Scientific Reports, 16AUG2012

It was claimed that the incident light can be gradually slowed down and finally trapped in a tapered metamaterial waveguide. Here we show that the energy incident from the input port of the tapered metamaterial waveguide will be totally reflected (instead of being trapped) due to the strong intermodal coupling between the forward and backward modes. The underlying physical mechanism for this strong intermodal-coupling is given.
TECHNICAL ARTICLE

Tags: Advanced materials, Materials science

AUTONOMOUS SYSTEMS & ROBOTICS

Video Friday: Squishy Bots, Squishier Bots, and Robot Cars Will Kill Your Grandma

IEEE Spectrum, 20AUG2012

How many squishy robot videos can you handle? Hopefully, at least two.

Tags: Autonomous systems & robotics

Hiding in Plain Sight

DARPA News, 16AUG2012

The costs associated with robotics are typically very high. What DARPA has achieved with silicone-based soft robots is development of a very low cost manufacturing method that uses molds. By introducing narrow channels into the molds through which air and various types of fluids can be pumped, a robot can be made to change its color, contrast, apparent shape and temperature to blend with its environment, glow through chemiluminescence, and most importantly, achieve actuation, or movement, through pneumatic pressurization and inflation of the channels. VIDEO

Tags: Autonomous systems & robotics, DARPA, Government S&T

BREAKTHROUGH TECHNOLOGY

'Electronic Nose' Prototype Developed: Device Has Applications in Agriculture, Industry, Homeland Security and the Military

Science Daily, 21AUG2012

Research by U Cal Riverside has enabled a California company to develop an "electronic nose" prototype that can detect small quantities of harmful airborne substances. The key to the prototype is the nanosensor array. It uses functionalized carbon nanotubes, which are 100,000 times finer than human hair, to detect airborne toxins down to the parts per billion level. At present, it's about four inches by seven inches. The goal is to make it the size of a credit card. At that size, a multi-channel sensor would be able to detect up to eight toxins. A single-channel sensor device could be the size of a fingernail.

Tags: Breakthrough technology, Sensors

Tunneling with the Help of Terahertz Photons

THz Science and Technology Network, 20AUG2012

Researchers in Japan studied quantum dots made from indium arsenide, offering an energy-level spacing well matched to terahertz frequencies. They grew quantum dots with molecular-beam epitaxy and placed a single dot between electrodes separated by a nanometer-size gap. They generated the terahertz field by pumping methanol gas with an infrared laser and coupled it to the dot via an antenna structure and a hemispherical silicon lens. Their results offer encouraging signs that the behavior of single carriers could be controlled by light in a challenging frequency range suitable for applications in spintronics and nanoelectronics. TECHNICAL ARTICLE

Tags: Breakthrough technology, S&T Japan, Terahertz technology

COMMUNICATIONS TECHNOLOGY

Research team finds way to use photon shape to encode messages

PhysOrg.com, 21AUG2012

Current techniques allow for sending signals as 1's or 0's based on the polarization of individual photons, i.e. they are either vertical or horizontal. But now it appears there is a better way, using the unique shape of photons to represent as many characters as needed, the alphabet, for example. A team of international researchers has found a way to use lasers to identify unique shapes of photons and to then recover information that was encoded in them.
TECHNICAL ARTICLE

Tags: Communications Technology, Cyber Security

"There is no adequate defense, except stupidity, against the impact of a new idea."
PERCY WILLIAMS BRIDGMAN

Surface emitters set a new world record for spectral bandwidth

PhysOrg.com, 21AUG2012

Scientists in Germany have developed semiconductor lasers that emit light over a wavelength range of 100 nm, a new world record for a single semiconductor laser. Such lasers might allow more efficient, lower-cost operation of future fiberoptic telecommunications networks and the development of high-responsivity gas sensors.

Tags: Communications Technology, S&T Germany

MIT-developed 'microthrusters' could propel small satellites

MIT News, 20AUG2012

The device designed by researchers is a flat, compact square—much like a computer chip—covered with 500 microscopic tips that, when stimulated with voltage, emit tiny beams of ions. Together, the array of spiky tips creates a small puff of charged particles that can help propel a shoebox-sized satellite forward. VIDEO

Tags: Communications Technology, Space technology

COUNTER WMD

Anthrax Targets

Science Newsline, 20AUG2012

Researchers in India have fished out sixteen membrane-bound proteins, seven proteases and three adhesion molecules that are all novel from their trawl any one of which might now be used in the rational design of new drugs with previously unused modes of action. This latter point is most important in reducing the chances of the bacteria quickly evolving resistance.

Tags: Counter WMD, Biology, S&T India

CYBER SECURITY

Researchers make quantum processor capable of factoring a composite number into prime factors

Science Daily, 20AUG2012

A group of researchers at UC Santa Barbara has designed and fabricated a quantum processor capable of factoring a composite number—in this case the number 15—into its constituent prime factors, 3 and 5. Factoring very large numbers is at the heart of cybersecurity protocols, such as the most common form of encoding, known as RSA encryption. TECHNICAL ARTICLE

Tags: Cyber security, Quantum science

ENERGY

Self-charging battery both generates and stores energy

PhysOrg.com, 21AUG2012

Renewable energy technologies generally consist of two distinct processes: energy generation and energy storage. These two processes are always accomplished through two separate units. For the first time, engineers at the Georgia Institute of Technology have demonstrated that energy can be generated and stored in a single device that converts mechanical energy directly to chemical energy, bypassing the intermediate step of electricity generation. The device basically acts as a hybrid generator-battery unit, or in other words, a self-charging power cell. TECHNICAL ARTICLE

Tags: Energy

ENVIRONMENTAL SCIENCE

Experiment Would Test Cloud Geoengineering as Way to Slow Warming

Newswise, 20AUG2012

The theory behind so-called marine cloud brightening is that adding particles, in this case sea salt, to the sky over the ocean would form large, long-lived clouds. Clouds appear when water forms around particles. Since there is a limited amount of water in the air, adding more particles creates more, but smaller, droplets. It turns out that a greater number of smaller drops has a greater surface area, so it means the clouds reflect a greater amount of light back into space.

Tags: Environmental science, Climatology

FORECASTING

Where Will You Be December 18th at 6PM?

IEEE Spectrum, 21AUG2012

Short-term predictions are myopic, so they look at a very specific localized context. With Far Out, we take a more global view of people's location data, and for each person we learn a library of prototypical days which we call eigendays, and these eigendays have the property that they capture the dependable repeating components of people's location signal, and they filter out the transient and undependable aspects of human mobility. There's a lot of utility to being able to make those predictions, whether you're a credit card company trying to detect fraud in an individual account or a highway-traffic engineer deciding when to schedule a road repair. TECHNICAL ARTICLE

Tags: Forecasting, Information technology

INFORMATION TECHNOLOGY

Computer program recognises any language

Research Council of Norway, 21AUG2012

New technology that allows computers to recognise any language without pre-learning stands to revolutionise automatic speech recognition. The Norwegian researchers have demonstrated that the production of human speech is fundamentally the same across languages. As such, the technology being developed will be applicable to any language without being reliant on speech data for each individual language to train a machine.

Tags: Information Technology

Featured Resource

PLoS Synthetic Biology Collection

This collection aims to highlight PLOS ONE's role in the emerging interdisciplinary field of synthetic biology. Articles are presented in order of publication date. As the field continues to develop, the collection will be updated to include new publications, thereby tracking the evolution of this dynamic research area.

Gloves turn hand gestures into speech (w/video)

BBC News, 21AUG2012

A team of Ukrainian students have developed gloves that can turn hand gestures into speech using computer technology. The team has built a number of prototypes and tested them with sign language users in Ukraine.

Tags: Information Technology, Communications Technology

MATERIALS SCIENCE

Batteries made from world's thinnest material could power tomorrow's electric cars

PhysOrg.com, 21AUG2012

Researchers at Rensselaer Polytechnic Institute made a sheet of paper from the world's thinnest material, graphene, and then zapped the paper with a laser or camera flash to blemish it with countless cracks, pores, and other imperfections. The result is a graphene anode material that can be charged or discharged 10 times faster than conventional graphite anodes used in today's lithium (Li)-ion batteries. TECHNICAL ARTICLE

Tags: Materials science, Energy

A new route to dissipationless electronics

Science Daily, 20AUG2012

A team of researchers at RIKEN and the University of Tokyo has demonstrated a new material that promises to eliminate loss in electrical power transmission. The surprise is that their methodology for solving this classic energy problem is based upon the first realization of a highly exotic type of magnetic semiconductor first theorized less than a decade ago—a magnetic topological insulator. TECHNICAL ARTICLE

Tags: Materials science, S&T Japan

Imprisoned Molecules 'Quantum Rattle' in Their Cages

Science Daily, 20AUG2012

The nano-metre sized cavity of the hollow spherical C60 Buckminsterfullerene—or bucky ball—effectively creates a 'nanolaboratory', allowing detailed study of the quantum mechanical principles that determine the motion of the caged molecule, including the mysterious wave-like behaviour that is a fundamental property of all matter. An international team of reserchers has revealed the wave-like behaviour and shown how the imprisoned H2 and H2O molecules 'quantum rattle' in their cage. TECHNICAL ARTICLE

Tags: Materials science, Nanomaterials, Quantum science

New form of carbon can put a dent in a diamond

Science Daily, 16AUG2012

Scientists at Carnegie Mellon University have observed a new form of very hard carbon clusters, which are unusual in their mix of crystalline and disordered structure. The material is capable of indenting diamond. This finding has potential applications for a range of mechanical, electronic, and electrochemical uses. TECHNICAL ARTICLE

Tags: Materials science, Advanced materials

MICROELECTRONICS

A*STAR IME develops ultra low power analog-to-digital converter for medical devices and wireless sensor nodes.

Asia Research News, 20AUG2012

Researchers from A*STAR IME have developed an analog-to-digital converter that uses only 400 nW, the lowest power consumption reported to date. The ultra low power converter will become one of the key elements in emerging wireless sensor networks, sensor clouds, and sensor fusion for various important applications such as environmental monitoring, industrial monitoring and control, green buildings, smart transportation, and e-health.

Tags: Microelectronics

Powerful new chip helps diagnose disease, analyzes protein interactions

Science Daily, 20AUG2012

Researchers at Stanford University and Intel Corp. have collaborated to synthesize and study a grid-like array of short pieces of a disease-associated protein on silicon chips normally used in computer microprocessors. Although the new technology is focused on research applications, it has the potential to eventually improve diagnoses of a multitude of diseases, as well as to determine more quickly what drugs may be most effective for a particular patient. It may also speed drug development by enabling researchers to better understand how proteins interact in the body. TECHNICAL ARTICLE

Tags: Microelectronics

PHOTONICS

Scientists shed light on glowing materials

Science Daily, 20AUG2012

Researchers in Spain used a new technique which combines electronic excitation and optical detection, to explore the inside of a photonic crystal and study the confinement of light. Working with a spatial resolution of 30 nanometers, they examined the structures at a resolution more than ten times smaller than the diffraction limit for light, revealing a greater understanding of how light interacts with matter to create, for example, the visible iridescence phenomena observed in nature on the wings of butterflies. This is the key to advance nanophotonic science and it can be useful to design novel optical devices, more efficient solar cells and displays, or novel quantum optics and information technologies. TECHNICAL ARTICLE

Tags: Photonics, Photonics

QUANTUM SCIENCE

Strange quantum phenomenon produces squeezed light

UC Brekeley, 16AUG2012

Using a unique optical trapping system that provides ensembles of ultracold atoms, scientists at Lawrence Berkeley National Laboratory and UC Berkeley, have recorded the first direct observations of distinctly quantum optical effects—amplification and squeezing—in an optomechanical system. Their findings point the way toward low-power quantum optical devices and enhanced detection of gravitational waves among other possibilities.

Tags: Quantum science, Government S&T

SCIENCE WITHOUT BORDERS

Math team may put 'wrinkle' in general relativity

Futurity.com, 21AUG2012

Researchers at UC Davis show that space-time cannot be locally flat at a point where two shock waves collide. They are investigating whether the steep gradients in the space-time fabric at a regularity singularity could create any effects that are measurable in the real world. For example, they wonder whether they might produce gravity waves.

Tags: Science without borders

Rogue med student tackles the web's peer-review irony

Wired UK, 20AUG2012

In 2008, the former medical student and virology PhD candidate at Harvard, Ijad Madisch, founded a web service called ResearchGate, which seeks to replace peer-reviewed journals with a kind of Facebook for scientists. Part of the aim is to share research even before it's packaged into a formal paper—including "negative data" that may show that a particular thesis isn't worth following.

Tags: Science without borders

The Truth About Terahertz

IEEE Spectrum, 20AUG2012

The terahertz regime is that promising yet vexing slice of the electromagnetic spectrum that lies between the microwave and the optical, corresponding to frequencies of about 300 billion hertz to 10 trillion hertz (or if you prefer, wavelengths of 1 millimeter down to 30 micrometers). There is still a great deal that we don't know about working at terahertz frequencies. We need to develop accurate and robust computational models for analyzing device design and operation at terahertz frequencies. Such models will be key to future advances in the field. We also need a better understanding of material properties at terahertz frequencies, as well as general terahertz phenomenology. RELATED ARTICLE 1; RELATED ARTICLE 2

Tags: Science without borders, Terahertz technology

The Emerging Revolution in Game Theory

MIT Technology Review, 16AUG2012

The world of game theory is currently on fire. In May, Freeman Dyson at Princeton University and William Press at the University of Texas announced that they had discovered a previously unknown strategy for the game of prisoner's dilemma which guarantees one player a better outcome than the other. The new approach is called the zero determinant strategy. TECHNICAL ARTICLE

Tags: Science without borders, Mathematics

PLoS ONE launches Synthetic Biology Collection

EurekAlert, 15AUG2012

The new collection contains an unprecedented number of articles illustrating the many facets of this dynamically evolving research area. WEBSITE

Tags: Science without borders, Biology, Synthetic biology

SENSORS

Liquid metal marbles as a novel platform for developing soft electronics

Nanowerk Spotlight, 21AUG2012

A 'liquid marble' coated with micro- or nanoparticles is a novel kind of microfluidic device, one that is especially useful for handling single liquid droplet. Here, a liquid droplet is not confined to a closed channel and there is no risk of it being adsorbed on a channel wall. Researchers have now come up with the idea of developing 'liquid metal marbles' when they wanted to develop a flexible conductive system for electronic and electromagnetic units. Video. TECHNICAL ARTICLE

Tags: Sensors, Microfluidics

Electronic sensing with your fingertips

Nanowerk Spotlight, 16AUG2012

Researchers at the University of Illinois at Urbana-Champaign have demonstrated that they can integrate high-quality silicon and other semiconductor devices on thin, stretchable sheets, to make systems that not only match the mechanics of the epidermis, but take the full three dimensional shapes of the fingertip—and, by extension, other appendages or even internal organs, such as the heart. TECHNICAL ARTICLE

Tags: Sensors, Advanced materials

STEM

We need a data science revolution in our universities

Wired UK, 20AUG2012

A recent global survey from EMC found that 65 percent of data science professionals believe demand for data science talent will outpace supply over the next five years, while a report from last year by McKinsey identified the need in the U.S. alone for at least 190,000 deep analytical data scientists in the coming years. Academia should do everything it can to encourage students to learn software skills by integrating technical computing languages into the curriculum.

Tags: STEM

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