



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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FEATURE ARTICLES

[Bottling up sound waves](#)

[Nanowerk, 04AUG2014](#)

Researchers at DOE's Lawrence Berkeley National Laboratory have developed a technique for generating acoustic bottles in open air that can bend the paths of sound waves

along prescribed convex trajectories. Potential applications include advanced ultrasonic imaging and therapy, and acoustic cloaking, levitation and particle manipulation. [TECHNICAL ARTICLE](#)

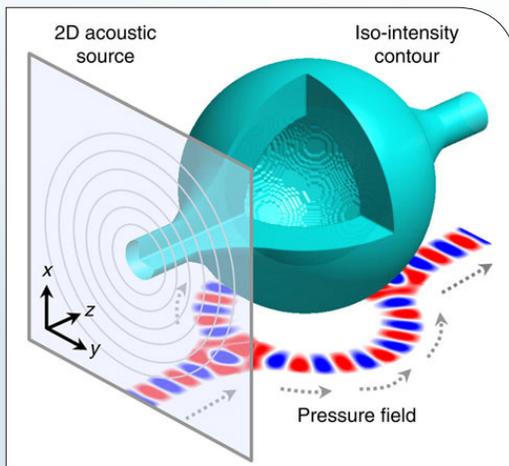
Tags: Breakthrough technology, Government S&T, Featured Article

[Nasa validates 'impossible' space drive](#)

[Wired \(UK\), 31JUL2014](#)

Researchers at NASA demonstrated viability of using classical magnetoplasma dynamics to obtain a propulsive momentum transfer via the quantum vacuum virtual plasma. Approximately 30-50 micro-newtons of thrust were recorded from an electric propulsion test article consisting primarily of a radio frequency resonant cavity excited at approximately 935 megahertz. [TECHNICAL ARTICLE](#)

Tags: Government S&T, Science without borders, Featured Article



After being emitted from a planar-phased source, sound energy forms a 3D acoustic bottle of high-pressure walls and a null region in the middle. Pressure field at bottom shows self-bending ability of the bottle beam to circumvent 3D obstacles. Dashed arrows indicate wave front direction. (Courtesy of Xiang Zhang group)

S&T NEWS ARTICLES

ADVANCED MATERIALS

[New material structures bend like microscopic hair](#)

[Science Daily, 06AUG2014](#)

Researchers at MIT have fabricated a new elastic material coated with microscopic, hairlike structures that tilt in response to a magnetic field. Depending on the field's orientation, the microhairs can tilt to form a path through which fluid can flow; the material can even direct water upward, against gravity. [TECHNICAL ARTICLE](#)

Tags: Advanced materials

[New material allows for ultra-thin solar cells](#)

[Nanowerk, 04AUG2014](#)

Researchers in Austria successfully combined ultra-thin layers of tungsten diselenide and molybdenum disulfide creating a designer-material that may be used in future low-cost solar cells. As it only consists of a few atomic layers, it is extremely light weight (300 square meters weigh only one gram), and very flexible. Now the team is working on stacking more than two layers—which will reduce transparency, but increase the electrical power. [TECHNICAL ARTICLE](#)

Tags: Advanced materials

[Planting imperfections at specific spots within diamond lattice could advance quantum computing](#)

[PhysOrg.com, 04AUG2014](#)

Researchers at the University of Chicago developed a new technique which successfully localized NV centers within a cavity approximately 180 nanometers across—a volume small enough to be compatible with many diamond-based nanostructures used in sensing devices and experimental quantum information systems. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, Materials science

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Silicon nanorods bend light in new directions**Physics World, 04AUG2014**

Using silicon nanorods, researchers in the US have created ultrathin coatings that arbitrarily manipulate the phase and polarization of electromagnetic waves. The coatings could be used in new types of optical components that are much less bulky than traditional lenses. The technique could even be used to bend light in ways not possible with conventional lenses. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials, Photonics***Light pulses control graphene's electrical behavior****Nanowerk, 01AUG2014**

Researchers at MIT found that by controlling the concentration of electrons in a graphene sheet, they could change the way the material responds to a short but intense light pulse. If the graphene sheet starts out with low electron concentration, the pulse increases the material's electrical conductivity. The discovery could enable its use as a broadband light detector. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials, Materials science***Carnegie Mellon chemists create nanofibers using unprecedented new method****EurekAlert, 31JUL2014**

Researchers from Carnegie Mellon University have developed a novel method for creating self-assembled protein/polymer nanostructures that are reminiscent of fibers found in living cells. The work offers a promising new way to fabricate materials for drug delivery and tissue engineering applications.

*Tags: Advanced materials***Chemists demonstrate 'brick-and-mortar' assembly of new molecular structures****Science Daily, 31JUL2014**

Researchers at Indiana University, Bloomington, have described the self-assembly of large, symmetrical molecules in bricks-and-mortar fashion, a development with potential value in the field of organic electronic devices such as field-effect transistors and photovoltaic cells. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials***Patterning bumpy surfaces****Nanotechweb, 30JUL2014**

Researchers in Finland utilize atomic layer deposition (ALD) of ion-sensitive resist for the very conformal coating of non-planar sample surfaces. They also demonstrate the fabrication of suspended nanobridges across the inclined walls of micron-scale grooves. The invention brings new functionalities for micro- and nanofluidics, and lab-on-a-chip applications. [TECHNICAL ARTICLE](#)

Tags: Advanced materials

AUTONOMOUS SYSTEMS & ROBOTICS

Video Friday: MorpHex Hexapod, Cheering Robots, and MIT Robotics Competition**IEEE Spectrum, 01AUG2014**

Robots and humans have very different ways of looking at the world, in that our eyes and brains have physical structures that are not at all alike. Neurala is trying to close that gap with a sensor system that more closely emulates the way our eyes experience the world.

Tags: Autonomous systems & robotics

BIOTECHNOLOGY

New tools advance bio-logic**Science Daily, 04AUG2014**

Researchers at Rice University have designed modular genetic circuits engineered from parts of otherwise unrelated bacterial genomes that can be set up to handle multiple chemical inputs simultaneously with a minimum of interference from their neighbors. The work gives scientists more options as they design synthetic cells for specific tasks. [TECHNICAL ARTICLE](#)

Tags: Biotechnology

CYBER SECURITY

Malware sneaks into online ads.**PhysOrg.com, 01AUG2014**

According to the Cisco 2014 Annual Security Report, hackers are increasingly slipping malicious software into online advertising, creating risks for the Internet economic model. Malvertising victims are infected with malware in the course of their normal Internet browsing and therefore have no idea where or how they were infected. [REPORT](#)

Tags: Cyber security

ENERGY

Researchers develop new wireless power transfer technique**PhysOrg.com, 04AUG2014**

Researchers in South Korea used a metamaterial slab in a resonant coupling method to significantly improve the efficiency of the power transfer, and retain this efficiency over greater distances than previously possible. The technology can be used in other applications such as high gain antennas and magnetic resonance imaging systems. [TECHNICAL ARTICLE](#)

*Tags: Energy***Scientists develop pioneering new spray-on solar cells****PhysOrg.com, 01AUG2014**

Researchers in the UK are the first to fabricate perovskite solar cells using a spray-painting process. They replaced

“In science we must be interested in things, not in persons.”

MARIE CURIE

the key light absorbing layer—the organic layer—with a spray-painted perovskite. The discovery could help cut the cost of solar electricity.

Tags: Energy, S&T UK

Efficient triple-junction polymer solar cell design sets new record

[Nanowerk Spotlight](#), 31JUL2014

Researchers at UCLA present an efficient design for a triple-junction organic tandem solar cell featuring a configuration of bandgap energies designed to maximize the tandem photocurrent output. The key innovation in this study is the demonstration of organic materials being able to mimic the record-setting efficiency of triple-junction structures in III-V solar cells. [TECHNICAL ARTICLE](#)

Tags: Energy, Materials science, Solar energy

FORECASTING

TED talk: A 30-Year History of the Future

[Foresight Institute](#), 30JUL2014

Nicholas Negroponte, founder of the MIT media lab and the One Laptop Per Child program, gave a TED talk in March 2014 titled *A 30-Year History of the Future*. [Talk](#), [TEDBlog](#), [article](#) discussing the talk.

Tags: Forecasting

INFORMATION TECHNOLOGY

3-D codes yield unprecedented physics, engineering insights

[PhysOrg.com](#), 04AUG2014

NASA codes and Icarus—a Sandia Direct Simulation Monte Carlo, or DSMC code—for accident simulations proved critical for determining the cause of shuttle Columbia accident. Researchers at Sandia National Laboratory have created a parallel three-dimensional DSMC code called [SPARTA](#) which represents physical reality more accurately than 2-D codes.

Tags: Information Technology, Government S&T

New record set for data-transfer speeds

[Science Alert \(Australia\)](#), 01AUG2014

Using a new kind of multi-core optical fibre, which is capable of letting multiple data streams pass through it simultaneously, researchers in Denmark have achieved a transfer rate of 43 terabits per second over a single fibre with one laser transmitter.

Tags: Information Technology

Breakthrough elastic cloud-to cloud networking

[PhysOrg.com](#), 30JUL2014

Working under the auspices of DARPA's CORONET program, which focuses on rapid reconfiguration of terabit, researchers announced a proof-of-concept technology that reduces set up times for cloud-to-cloud connectivity from days to seconds. This advance is a major step forward that could one day lead to sub-second provisioning time with IP and next generation optical networking equipment. It could also enable elastic bandwidth between clouds at high connection request rates using intelligent cloud data center orchestrators.

Tags: Information Technology, Government S&T

MATERIALS SCIENCE

'Active' surfaces control what's on them: Scientists develop treated surfaces that can actively control how fluids or particles move

[Science Daily](#), 01AUG2014

An international team of researchers (USA, Saudi Arabia) has developed a new way of making surfaces that can actively control how fluids or particles move across them. The work might enable new kinds of biomedical or microfluidic devices, or solar panels that could automatically clean themselves of dust and grit. [TECHNICAL ARTICLE](#)

Tags: Materials science

Unexpected phenomenon discovered at the surface of a transition metal oxide material

[PhysOrg.com](#), 01AUG2014

An international team of researchers (USA, Japan, China) report that it is possible to detect and characterize the smallest features on the surfaces of transition metal oxides, even down to the atomic scale. This could lead to huge advancements in the understanding and control of electronic, magnetic and chemical properties of this important class of materials.

Tags: Materials science

Researchers seek broadband/multiband electromagnetic absorbers based on plasmonic and metamaterial structures

[PhysOrg.com](#), 31JUL2014

In a review article, researchers in China give an overview on the principle of different types of narrowband EM absorbers as well as the various approaches to achieve broadband/multiband absorbers. Many mechanisms of EM absorption based on metallic structures, as well as metamaterial-based schemes, are described. [TECHNICAL ARTICLE](#)

Tags: Materials science

continued...

Superconductors: Physical link to strange electronic behavior

Science Daily, 31JUL2014

Based on sophisticated neutron measurements, researchers at Rice University have the first evidence of a link between magnetic properties and the material's tendency, at sufficiently low temperatures, to become a better conductor of electricity in some directions than in others. [TECHNICAL ARTICLE](#)

Tags: *Materials science*

Will Silicon Save Quantum Computing?

IEEE Spectrum, 31JUL2014

Silicon had a fairly slow start as a potential quantum-computing material, but a flurry of recent results has transformed it into a leading contender. Silicon-based qubits can be manufactured using conventional semiconductor techniques and promise to be exceptionally stable and compact. We have every reason to think that silicon will survive the next big computational leap, from the classical to the quantum age.

Tags: *Materials science, Quantum science*

FEATURED RESOURCE

Techspot

TechSpot delivers breaking tech news and analysis to enthusiasts and industry professionals. News coverage is complemented by comprehensive product reviews, guides, and long-form features, software recommendations, and a massive tech product database. [RSS](#)

NEUROSCIENCE

Could your brain be reprogrammed to work better?

Science Daily, 06AUG2014

An international team of researchers (Australia, France) has shown that electromagnetic stimulation can alter brain organization, which may make your brain work better. In a new study, the researchers demonstrated that weak sequential electromagnetic pulses (repetitive transcranial magnetic stimulation -- or rTMS) on mice can shift abnormal neural connections to more normal locations.

Tags: *Neuroscience*

PHOTONICS

On-chip topological light: First measurements of transmission and delay

Science Daily, 01AUG2014

An international team of researchers (US, the Netherlands) report that topological transport of light is the photonic analog of topological electron flow in certain semiconductors. In the electron case, the current flows around the edge of the material but not through the bulk. It is "topological" in that even if electrons encounter impurities in the material the electrons will continue to flow without losing energy. [TECHNICAL ARTICLE](#)

Tags: *Photonics, Materials science*

High-gain optical transistors flipped by just one photon

Physics World, 30JUL2014

Two independent teams of physicists in Germany have created the first high-gain optical transistors that can be switched using a single photon. The devices make use of the "Rydberg blockade", whereby the creation of an atom in a highly excited state has a huge effect on the ability of the surrounding gas to transmit light. The research might lead to the development of all-optical logical circuits.

Tags: *Photonics, S&T Germany*

QUANTUM SCIENCE

Study explains how Maxwell's demon uses mutual information to extract work

PhysOrg.com, 04AUG2014

In an experiment involving tunneling electrons, an international team of researchers (Finland, Japan, Switzerland) shows how the mutual information created by a measurement can be used to implement feedback control that enables the extraction of useful work. [TECHNICAL ARTICLE](#)

Tags: *Quantum science, Particle physics*

When particles fall left and right at the same time: Physicists develop new method to verify quantum entanglement

Science Daily, 01AUG2014

In the quantum world it is possible in principle for particles of a system to fall both left and right at the same time. Differentiating this "and" state—the quantum entanglement of particles—from the classical "or" is an experimental challenge. Researchers in Germany have devised a novel and universal method that enables entanglement verification for states of large atomic systems. [TECHNICAL ARTICLE](#)

Tags: *Quantum science, S&T Germany*

Mapping the optimal route between two quantum states

Nature, 31JUL2014

Investigation by researchers at UC Berkeley reveals the rich interplay between measurement dynamics, typically associated with wavefunction collapse, and unitary evolution of the quantum state as described by the Schrödinger equation. These results and the underlying theory, based on a principle of least action, reveal the optimal route from initial to final states. It may also inform new quantum control methods for state steering and information processing.

Tags: Quantum science

Quantum physics: The path most travelled

Nature, 30JUL2014

Researchers in Canada report that continuous tracking of the random trajectories of a superconducting quantum system as it evolves between two selected initial and final states has allowed researchers to determine the most probable path of the system.

Tags: Quantum science, S&T Canada

SENSORS

Extracting audio from visual information: Algorithm recovers speech from vibrations of a potato-chip bag filmed through soundproof glass

Science Daily, 04AUG2014

Researchers at MIT, Microsoft, and Adobe have developed an algorithm that can reconstruct an audio signal by analyzing minute vibrations of objects depicted in video. In one set of experiments, they were able to recover intelligible speech from the vibrations of a potato-chip bag photographed from 15 feet away through soundproof glass. [VIDEO](#)

Tags: Sensors

Using Insect Electroantennogram Sensors on Autonomous Robots for Olfactory Searches (w/video)

JOVE, 04AUG2014

Researchers in France describe a protocol for using insect antennae in the form of electroantennograms (EAGs) on autonomous robots. The experimental design allows stable recordings within a day and resolves individual odor patches up to 10 Hz. The efficiency of EAG sensors for olfactory searches is demonstrated in driving a robot toward an odor source.

Tags: Sensors, S&T France ■

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