Volume 3, Issue 12 ■ 22MAR2013

S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

Feature Articles

Lasers of Pure Sound

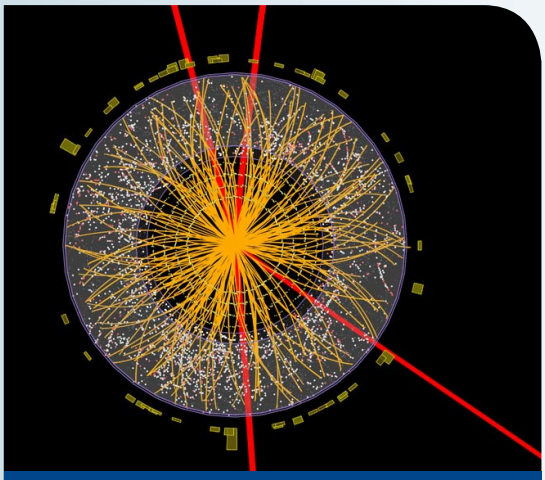
American Physical Society, 18MAR2013

Recently, the laser idea was extended to sound waves, leading to the conceptualization of the acoustic analog of a laser, which emits phonons (lattice vibrations) instead of photons. Researchers in Japan report on the experimental demonstration of a purely mechanical counterpart of a three-level laser scheme. The device, excited by acoustic vibrations, amplifies sound waves through stimulated emission of phonons and acts as a phonon laser: a spectrally pure source of phonons with a frequency of around 1.7 megahertz (MHz). TECHNICAL ARTICLE

Tags: Photonics, S&T Japan, Featured Article

Higgs Boson Positively Identified

Science NOW, 17MAR2013



Plainly. An event display shows a Higgs candidate decaying to four electrons in the ATLAS detector. New measurements confirm that the Higgs is a Higgs. Credit: ATLAS Collaboration/CERN

To make the positive identification, researchers relied on observations of how the Higgs boson decays into combinations of other, more familiar particles. Key characteristics of the Higgs include its spin and its parity, a symmetry property. Although not yet entirely conclusive, current measurements show that the new particle has no spin (as opposed to 1 or 2 quantum units of it) and positive parity.

Tags: Breakthrough technology, Particle physics, Featured Article

Electrons behaving like a particle and a wave: Feynman's double-slit experiment brought to life

Science Daily, 14MAR2013

The precise methodology of Richard Feynman's famous double-slit thought-experiment—a cornerstone of quantum mechanics that showed how electrons behave as both a particle and a wave—has been followed in full for the very first time by researchers at the University of Nebraska. TECHNICAL ARTICLE

Tags: Quantum science, Featured Article

S&T News Articles

AUTONOMOUS SYSTEMS & ROBOTICS

Robo-Chopper Dives and Grabs Objects Like a Bird of Prey

Wired Danger Room, 19MAR2013

Researchers at the University of Pennsylvania have a drone with an eagle's ability to swoop down and grip its prey. They want the next version to be stronger, more accurate and able to find its way to a perch—and do it real stealthy-like. VIDEO

Tags: Autonomous systems & robotics

Video Friday: Fly-By Grasping, Quadrotors in Africa, and ROS Does Minecraft

IEEE Spectrum, 15MAR2013

With ICRA 2013 in just a few months, robotics research videos are on the rise, and we've got them here for you.

Tags: Autonomous systems & robotics

BIOTECHNOLOGY

Research collaboration to develop organs-on-chips

Nanowerk, 18MAR2013

Harvard University and Sony announced a collaboration to further advance Organs-on-Chips technologies. Human

continued...

BACK TO TOP

Organs-on-Chips are composed of a clear, flexible polymer about the size of a computer memory stick, and contain hollow microfluidic channels lined by living human cells – allowing researchers to recapitulate the physiological and mechanical functions of the organs, and to observe what happens in real time.

Tags: Biotechnology

COMMUNICATIONS TECHNOLOGY

DARPA Seeks More Robust Military Wireless Networks

DARPA News, 18MAR2013

The Wireless Network Defense program's key objective is to develop protocols that determine the viability and trustworthiness of neighboring nodes and automatically adapt the network to operate through problems. Current security efforts focus on individual radios or nodes, rather than the network, so a single misconfigured or compromised radio could debilitate an entire network. Proposers' Day

Tags: Communications Technology, DARPA, Government S&T

NASA's first laser communication system integrated, ready for launch

Science Daily, 17MAR2013

The LLCD (Lunar Laser Communication Demonstration) mission will use a highly reliable infrared laser. Data, sent in the form of hundreds of millions of short pulses of light every second, will be sent by the LADEE spacecraft to any one of three ground telescopes in New Mexico, California and Spain. The system will enable higher rates of satellite communications similar in capability to high-speed fiber optic networks on Earth.

Tags: Communications Technology, Government S&T, NASA

CYBER SECURITY

10 Web Threats To Watch

Information Week, 18MAR2013

The Web presents a variety of security threats for unwary businesses, from well-known SQL injection and cross-site scripting attacks to more esoteric threats posed by Web scraping and HTML5's many features. What follows are 10 Web threats we think are particularly worrisome, either because they're becoming more popular with attackers or because security pros and developers tend to overlook them.

Tags: Cyber security

ENVIRONMENTAL SCIENCE

The science of clouds: Why they matter, and why there may be fewer of them

PhysOrg.com, 17MAR2013

According to researchers at Lawrence Berkeley National Laboratory we don't understand many basic things about clouds. We don't know why clouds rise at the speeds they do. We don't know why they are the sizes they are. We lack a fundamental theory for what is a very peculiar case of fluid flow. The largest source of uncertainty in today's climate models are clouds.

Tags: Environmental science, Climatology

Guiding responsible research in geoengineering

Harvard University, 15MAR2013

The inherent tension that geoengineering efforts could present unforeseen new risks has thwarted both scientific advances and the development of an international framework for regulating and guiding geoengineering research. Experts from Harvard University and UCLA propose a new structure for regulation of geoengineering research. ARTICLE

Tags: Environmental science, Climatology

IMAGING TECHNOLOGY

Breaking the Diffraction Barrier Using Fluorescence Emission Difference Microscopy

Nature Scientific Reports, 16MAR2013

Termed fluorescence emission difference microscopy (FED), the physical mechanism proposed by researchers in China is based on the intensity difference between two differently acquired images. When fluorescence saturation is applied, the resolving ability of FED can be further enhanced. The validity of FED in practical use is demonstrated by experiments on fluorescent nanoparticles and biological cells in which a spatial resolution of $<\lambda/4$ is achieved. The new techniuqe may be widely applied in nanoscale investigations.

Tags: Imaging technology, S&T China

INFORMATION TECHNOLOGY

Can control theory make software better?

PhysOrg.com, 19MAR2013

A team of researchers from MIT and Georgia Tech shows how to apply principles from control theory—which analyzes dynamical systems ranging from robots to power grids—to formal verification. The result could help computer scientists expand their repertoire of formal-verification techniques, and it could be particularly useful in the area of approximate computation. TECHNICAL ARTICLE

Tags: Information Technology

Fantastic flash memory combines graphene and molybdenite

Science Daily, 19MAR2013

Scientists in Switzerland have combined two materials, graphene and molybdenite, with advantageous electronic properties into a flash memory prototype that is very promising in terms of performance, size, flexibility and energy consumption. Because molybdenite is thinner

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"Everything should be made as simple as possible, but not simpler."

ALBERT EINSTEIN

than silicon and thus more sensitive to charge, it offers great potential for more efficient data storage. TECHNICAL ARTICLE 1, 2

Tags: Information Technology, S&T Switzerland

The Rare Disease Search Engine That Outperforms Google

MIT Technology Review, 18MAR2013

Researchers in Denmark have set up a search engine called FindZebra, a name based on the common medical slang for a rare disease, dedicated to the diagnosis of rare diseases. After comparing the results from this engine against the same searches on Google on the basis of its famous PageRank algorithm., they show that it is significantly better at returning relevant results. FindZebra

Tags: Information Technology, Medical technology

Facebook Preferences Predict Personality Traits

Science NOW, 11MAR2013

Researchers in the UK have combined Facebook like data with information gathered from a personality survey to figure out whether likes can predict personality traits. It turns out that they can, and incredibly well. Sexual orientation, religion, and even drug use can all be inferred with surprising accuracy.

Tags: Information Technology

MATERIALS SCIENCE

Electrons are not enough: Cuprate superconductors defy convention

Science Daily, 19MAR2013

Researchers at the University of Illinois and the University of Pennsylvania tested Luttinger's theorem which states that the number of electrons in a material is the same as the number of electrons in all of its atoms added together. But their study found discrepancies between the measured charge and the number of mobile electrons in cuprate superconductors, defying Luttinger. TECHNICAL ARTICLE

Tags: Materials science

Novel luminescent materials to reduce global energy demand

Nanowerk, 19MAR2013

The European Commission has identified luminescent materials as a key technology of the next generation. Phosphors are used, for example, in traffic lights, computer screens, smartphones and tablets, Euro banknotes, medical devices, as well as in films for X-rays and light sources. Since China has limited the export of rare earths the search for phosphors that make do with less or even completely without rare earths is an important research topic.

Tags: Materials science, S&T Germany

Magnets are chaotic—and fast—at the very smallest scale

Nanowerk, 18MAR2013

Using a new type of camera that makes extremely fast snapshots with an extremely high resolution an international team of researchers (US, Netherlands, Germany, Japan) has shown that it would seem that the chaotic behaviour of the magnetic material is highly significant as far as the transport of magnetic information at the smallest possible scale is concerned. This will open up pathways for even smaller and faster magnetic data storage. TECHNICAL ARTICLE

Tags: Materials science, Information technology

Negative-charge carrying molecular structures created

Science Daily, 18MAR2013

University of Oregon researchers have synthesized organic molecular structures that move both positive and negative electrical charges—a highly desired but often difficult combination to achieve in current efforts to create highly flexible electronic devices and other new technologies. TECHNICAL ARTICLE

Tags: Materials science

Researchers trap light, improve laser potential of MEH-PPV polymer

e! Science News, 18MAR2013

Researchers from North Carolina State University have come up with a low-cost way to enhance a polymer called MEH-PPV's ability to confine light, advancing efforts to use the material to convert electricity into laser light for use in photonic devices.

Tags: Materials science

Inspired by deep sea sponges: Creating flexible minerals

Science Daily, 17MAR2013

Scientists in Germany have created a new synthetic hybrid material with a mineral content of almost 90 percent, yet extremely flexible. They recreated the sponge spicules using the natural mineral calcium carbonate and a protein of the sponge. The spicules of sponges thus offer a perfect example of a lightweight, tough, and impenetrable defense system, which may inspire engineers to create body armors of the future. VIDEO, TECHNICAL ARTICLE

Tags: Materials science

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'Metasurfaces' to usher in new optical technologies

Science Daily, 17MAR2013

Metasurfaces are extremely thin films of "metamaterials," assemblies that contain features, patterns or elements such as tiny antennas or alternating layers of oxides that enable an unprecedented control of light. According to researchers at Purdue University metasurfaces could make possible "planar photonics" devices and optical switches small enough to be integrated into computer chips for information processing and telecommunications. TECHNICAL ARTICLE

Tags: Materials science

Researchers Cross the 'Valley of Death' in Nanocomposite Design

IEEE Spectrum, 17MAR2013

Materials scientists were finding that the extraordinary properties of nanowires were disappearing—the properties of an entire composite were limited by the properties of other materials found in the material's matrix. Now researchers in Australia have found a way for composite materials to actually match the strength and flexibility of the nanowires that have been placed inside them. TECHNICAL ARTICLE

Tags: Materials science

Featured Resource

Foldit

Foldit is a revolutionary new computer game enabling you to contribute to important scientific research. The more interesting goal for Foldit is protein design. There aren't a lot of automated approaches to protein design, so Foldit's human folders will have less competition from the machines. RSS

MEDICAL SCIENCES

Scientists discover novel chemical that controls cell behavior

EurekAlert, 15MAR2013

A research team at the University of New Mexico has found a chemical compound that controls cell migration and adhesion, two important characteristics of metastatic cancer cells. TECHNICAL ARTICLE

Tags: Medical Sciences, Biology

MICROELECTRONICS

Taking transistors into a new dimension

Science Daily, 17MAR2013

Researchers in France built a nanometric transistor that displays exceptional properties for a device of its size. To achieve this result, the researchers developed a novel three-dimensional architecture consisting of a vertical nanowire array whose conductivity is controlled by a gate measuring only 14 nm in length. Use of 3D transistors could significantly increase the power of microelectronic devices. TECHNICAL ARTICLE

Tags: Microelectronics, S&T France

Researchers debut first robot controlled by carbon nanotube transistors

Nanowerk, 15MAR2013

While scientists have produced simple demonstrations of working carbon nanotube circuit components in the past, a Stanford team was able to demonstrate an actual subsystem composed entirely of the material.

Tags: Microelectronics, CNT, Nanotechnology

NEUROSCIENCE

Brain Researchers Can Detect Who We Are Thinking About

Scientific American, 17MAR2013

Scientists scanning the human brain can now tell whom a person is thinking of, the first time researchers have been able to identify what people are imagining from imaging technologies.

Tags: Neuroscience

How can we stlil raed words wehn teh lettres are jmbuled up?

Science Daily, 17MAR2013

Researchers in the UK have taken an important step towards understanding how the human brain 'decodes' letters on a page to read a word. The work will help psychologists unravel the subtle thinking mechanisms involved in reading, and could provide solutions for helping people who find it difficult to read, for example in conditions such as dyslexia. More

Tags: Neuroscience, S&T UK

Suppressing brain's 'filter' can improve performance in creative tasks

Science Daily, 17MAR2013

The brain's prefrontal cortex is thought to be the seat of cognitive control, working as a kind of filter that keeps irrelevant thoughts, perceptions and memories from interfering with a task at hand. Now, researchers at the University of Pennsylvania have shown that inhibiting this filter can boost performance for tasks in which unfiltered, creative thoughts present an advantage. TECHNICAL ARTICLE

Tags: Neuroscience

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QUANTUM SCIENCE

Smallest vibration sensor in the quantum world

Science Daily, 17MAR2013

Carbon nanotubes and magnetic molecules are considered building blocks of future nanoelectronic systems. Their electric and mechanical properties play an important role. Researchers in France and Germany have now found a way to combine both components on the atomic level and to build a quantum mechanical system with novel properties. TECHNICAL ARTICLE

Tags: Quantum science, S&T France, S&T Germany

S&T POLICY

China Increasing Defense Spending by 10.7 Percent

Defense Update, 17MAR2013

The People's Republic of China (PRC) has announced plans to increase defense spending in 2013 by 10.7 percent, to $115.7 billion. Actual spending is believed by some to be as much as 50 percent higher than the numbers publicly announced—amounting to about a third of the annual US defense budget.

Tags: S&T policy, Military technology, R&D Funding, S&T China

SCIENCE WITHOUT BORDERS

10 Companies Chasing Innovations That Really Matter

Wired, 18MAR2013

Plenty of companies out there are still taking a run at the next moonshot. Their technologies don't let you share photos or offer you a deal on your next manicure. Instead, these companies could change the world in deep ways by solving tough problems, rather than the kind of "problems" too many startups make up as justifcations for the "solutions" they're trying to sell.

Tags: Science without borders, Emerging technology

Signal processing: Look-up tables to shoulder the processing load

Science Daily, 17MAR2013

Researchers in Singapore and China have developed an efficient new method to implement an important step in signal processing, called the discrete cosine transform (DCT). Their method could lead to devices that occupy smaller areas, provide higher throughput of information, and consume less power than existing devices. TECHNICAL ARTICLE

Tags: Science without borders, Mathematics

When Innovating, Go Slow

IEEE Spectrum, 17MAR2013

Whether it's biomedical, digital, or electromechanical, systems-level innovation requires human ingenuity, even wisdom. And the wise adaptation of advances in techno-science—in the design, engineering, and management of large knowledge-based systems that deliver energy, information, transportation, security, food, and health—takes time. History of Innovation

Tags: Science without borders

SENSORS

Under the skin, a tiny laboratory

Science Daily, 19MAR2013

Researchers in Switzerland have developed a tiny, portable personal blood testing laboratory which is only a few cubic millimeters in volume but includes five sensors, a radio transmitter and a power delivery system that transmits the results to a doctor over the cellular phone network. Outside the body, a battery patch provides 1/10 watt of power, through the patient's skin.

Tags: Sensors, Biotechnology ■

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